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MONTE CARLO CODES FOR STUDY OF LIGHT TRANSPORT IN THE ATMOSPHERE

Volume II: Utilization Instructions

FINAL REPORT

By

D. G. COLLINS - M. B. WELLS

AUGUST 1965

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UNITED STATES ARMY ELECTRONICS COMMAND • FORT MONMOUTH, N.J.

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RADIATION RESEARCH ASSOCIATES, INC.

Fort Worth, Texas

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ABSTRACT

Monte Carlo procedures designated as LITE-I and LITE-II were developed to study the transport of light through the earth's atmosphere under various environmental conditions. LITE-I treats monochromatic light emitted from a point source, and LITE-II treats monochromatic plane sources of light. The codes have been written in both ALGOL for the Burrough's B-5000 and FORTRAN II for other computers. The codes are sufficiently flexible to treat multiple scattering in an atmosphere in which air density and aerosol size distribution vary independently and arbitrarily with altitude. Provision for treating ground and cloud reflection with an albedo method is also available in the codes.

The codes have been verified through comparisons with other calculations of light transport in the atmosphere. Utilization instructions, input data formats, sample problems, and the ALGOL listings of the codes are given to aid those who wish to utilize the codes.

FOREWORD

The authors wish to express their appreciation to Henrietta Hendrickson and Hemma Francis of Oak Ridge National Laboratory who aided in the checkout and running of test problems on the FORTRAN versions of the LITE codes. They also wish to acknowledge the assistance of Leon Leskowitz, of the U. S. Army Electronics Laboratory, Fort Monmouth, New Jersey, for his assistance in translating the FORTRAN codes to the ALGOL language and his many helpful suggestions during the checkout of the ALGOL versions of the LITE codes. The work described in this report was carried out under the technical monitorship of Dr. R. W. Fenn of the Atmospheric Sciences Laboratory, USAEC, Fort Monmouth, New Jersey.

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I. INTRODUCTION

The LITE-I and LITE-II codes were developed to study the transport of light in a plane atmosphere under various environmental conditions. LITE-I treats multiple scattering from a point source of light, and LITE-II treats multiple scattering from a plane source of light. The Monte Carlo methods utilized in the codes are described in detail in Volume I of this report. The description includes the methods used to describe an air-ground geometry, to treat Rayleigh and Mie scattering, and to treat ground and cloud reflection.

The LITE codes were written in both ALGOL for the B-5000 and FORTRAN II for other computers. This volume of the report includes the input data formats for the ALGOL versions of the codes. The input data formats for the FORTRAN versions are different from those in ALGOL versions, only in that the format for floating point numbers have an E preceding the exponent, rather than an @ symbol. That is, the number 217.8 would be written in floating form as 2.178@+02 for the ALGOL versions of the code, and 2.178E+02 for the FORTRAN versions. The order of the input data and field width specifications are the same for both the FORTRAN and ALGOL versions.

This volume of the report should be considered as a utilization document for the LITE-I and LITE-II codes. Operator instructions for running the LITE codes on the B-5000 computer and on the IBM 7090 are contained in Section II. The input data formats for the ALGOL versions of the two codes are given in Section III. The input and output of a sample problem run with each code, LITE-I and LITE-II, are discussed in Section IV. In Section V, listings of the ALGOL language instructions for the two LITE codes are presented.

II. OPERATOR INSTRUCTIONS

The ALGOL versions of the LITE codes were designed to run on the Burroughs B-5000 computer. The multi-processing feature of the B-5000 allows on-line read in and printout of data from one program while computation is being performed with another program. Thus the LITE codes may be read-in and printed-out on-line The Fort Monmouth computing center plans to store the object program on tape and read the program from tape to reduce the number of cards that have to be loaded each time a program is run with one of the codes. The ALGOL versions use no tape units other than those that a facility normally uses for input and output

The FORTRAN versions of the LITE codes are designed for off-line read-in and printout. The FORTRAN II binary decks and the problem decks are loaded on input tape 5 and the output is produced on output tape 6. No scratch tapes are required for the program operation.

The running time for the LITE codes is highly dependent upon the input data. In particular, the running time is dependent on the fraction of the total collisions that are taken to be Rayleigh scattering events, on the average number of collisions followed per history, and on the total number of histories followed. The multi-processing feature of the B-5000 makes it difficult to predict the machine time required to run a given problem unless the problem is the only one being processed in the B-5000. The time required to run a LITE-I problem on the B-5000 was checked for three separate runs of the problem. The times required for each of the three runs were found to be different, varying by a factor of three over the range of the

slowest to the fastest time. The average time per collision is estimated to be about .002 minutes for problems having five detector positions.

III INPUT DATA FORMATS

The input data formats for LITE-I and LITE-II are identical even though some of the input data used in LITE-I are not used in LITE-II. The provisions for reading in these items are the same for both codes, therefore, those input data not actually used in the LITE-II calculations are indicated by an asterick, and comments are made in the following sections prescribing how these items should be treated when preparing input data for LITE-II. The unit used to define distances (centimeters, meters, feet, etc.) should be the same for all distances described by the input data to the LITE codes. If the unit is meters, then the intensities are in units of photons m^{-2}/source photon for LITE-I and photons m^{-2}/source photon m^{-2} for LITE-II.

The input for the LITE codes is divided into ten groups. The number in column 10 of the first card of each group designates the group of input data that follows on that and succeeding cards.

3.1 Control Numbers

Table I contains control numbers in Group I that specify the amount of input data required. Some of the control numbers appear again in the other input groups. When this occurs, the two values input for the same item must agree or the program will detect an error and terminate the problem. The number of histories to be processed, NHMAX, may be divided into sample sizes of NHMAX/NGROUP. The sample size must be less than 500. The number of groups, NGROUP, into which the histories are divided, should be large enough to provide for an accurate calculation of a standard deviation. Six bases are input for the random number generator. This allows consecutive random numbers to be generated

TABLE I

GROUP 1 Input Data (Control Numbers)

Card	Format	Input Item	Definition	Limit
1	I10	LIBRAY	Input group number	=1
2	6I10	NHMAX	Number of histories	
		NGROUP	Number of deviation groups (The number of histories should be equally divisible by NGROUP.)	$\frac{\text{NHMAX}}{\text{NGROUP}} \leq 500$
		NRMAX	Number of regions	≤100
		NBMAX	Number of boundaries	≤100
		NCMAX	Maximum collisions allowed per history	
		NDMAX	Number of receivers	≤10
3	6I10	NPA	Number of print cosines	≤25
		NPCOL	Number of print collisions	≤24
		NAOP	Option for sampling source angles = -1, isotropic distribution, no biasing = 0, biased sampling from isotropic distribution = 1, anisotropic distribution	
		NAG	Number of cosines for defining source angular distribution	≤37
		NRFLB	Number of reflection boundaries	≤5
		NMAT	Number of regions having different Mie phase functions	≤10
4	6I10	NSOREG	Number of source region	
		MAXR	Maximum number of reflections allowed	
		IBASE	Base for random number generator	
		IBAS1	Base for random number generator	
		IBAS2	Base for random number generator	

TABLE I (con't)

Card	Format	Input Item	Definition	Limit
4	6I10	IBAS3	Base for random number generator	
5	2I10	IBAS4	Base for random number generator	
		IBAS5	Base for random number generator	

TABLE II

Group 2 Input Data

Card	Format	Input Item	Definition	Limit
1	I10	LIBRAY	Input group number	=2
2	6R10.4	HS	Source height	
		DLONG	Large distance for boundary distance calculation	
		DELTA	Small distance for stepping off boundary	
		SMVAL	Small value for testing cosine angle with zero	
		WCO	Weight cut-off parameter	
		ELIM	Maximum number of errors to be allowed	
3	R10.4	DMIN	Minimum distance from collision to receiver point	

using a different base Generating random numbers in this manner insures the independence between consecutive random numbers and decreases the possibility of producing identical histories when a random number generator recycles

3.2 Constants

Table II contains constants in Input Group 2 that are used by the code. Since the values to be assigned these constants depend on the individual problem, they are included as input rather than being fixed within the code. For economy, the distance, DLONG, should be greater than the maximum possible distance within an inside region. The distance, DELTA, should be a small value, but large enough to change the maximum possible distance within an inside region in the fifth or sixth significant digit when added to that distance ELIM is an input item that will prevent those errors that occur with a very small probability from terminating the problem When fewer than ELIM errors occur, those errors will be listed with the output, but only those histories containing the errors will be terminated. The results for all other histories will be saved and printed as output.

3.3 Source Angular Distribution

Input Group 3 data which are used to describe the source angular distributions are given in Table III. All angular distributions are considered to symmetrical about the vertical, H, axis The source angular distribution is assumed to be defined with a cumulative distribution expressed in terms of the cosine of the angle measured from the positive H axis. Provisions for sampling from a biased distribution

TABLE III. GROUP 3 Input Data (Source Angular Distribution)

Card	Format	Input Item	Definition	Limit
1	3I10	LIBRAY	Input group number	=3
		NAOP	Option for sampling source angles (See Table I)	
		NAG	Number of cosines for defining source angular distribution	≤37
2 continues on following cards	6R10.4	CANG(J)	Cosine values at which the cumulative source angular probabilities are given (cosines in descending order)	J=1, NAG
Follows last card containing CANG(J)	6R10.4	PAG(J)	Cumulative probabilities defining source angular distribution (first value must be zero, probabilities in ascending order)	J=1, NAG
Follows last card containing PAG(J)	6R10.4	WAG(J)*	Weight parameter for biased sampling from anisotropic distribution (omit unless NAOP=1)	J=1, NAG

* WAG(J) is the weight that will be assigned to particles emitted from the source at angles with cosines between CANG(J-1) and CANG(J). Thus WAG(1) is arbitrary, since it will never be used by the code.

are also included to improve the sampling in the directions toward the receiver positions. If the original angular distribution is isotropic, then the program adjusts the light particle weight automatically, but if the original distribution is anisotropic, then the weight adjustment parameters, WAG, must be input.

3.4 Reflection Distribution

Table IV lists Input Group 4 data which are used in describing the reflection of light from a ground or cloud surface. If the problem contains no reflection surfaces, this group of data may be omitted. A listing of Input Group 4 data is required for each reflection surface. The reflection surfaces are limited to 5 for any one problem and the boundary number assigned to any reflection surface must be less than or equal to 5. Reflection is limited to plane surfaces. The angular distribution of the reflected light must be expressed in terms of the cosine of the angle measured from the normal to the reflection surface and is assumed azimuthally symmetric. If the reflection distribution is isotropic in the upper or lower hemispheres, then the reflection angle distribution tables should be omitted. If the reflection distribution is anisotropic, then both the reflection distribution and the cumulative distribution must be input.

TABLE IV. GROUP 4 Input Data (Reflection Distributions)

Card	Format	Input Item	Definition	Limit
1	5I10	LIBRAY	Input group number	=4
		NRB	Number of reflection boundary	≤5
		JREFLT(NRB)	Reflection Option = 1, reflection isotropic in upper hemisphere = 2, anisotropic in upper hemisphere = 3, isotropic in lower hemisphere = 4, anisotropic in lower hemisphere	
		NRFANG(NRB)	Number of points used to define reflection distribution at boundary NRB	≤37
		NRFCOS(NRB)	Number of cosines defining cumulative reflection distribution at boundary NRB	≤50
2	R10.4	ALBEDO(NRB)	Reflection Albedo	
3 continues on following cards	6R10.4	*RFANG(NRB,J)	Cosines of angles used to define reflection distribution (omit if JREFLT(NRB)=1 or 3, descending order)	J=1, NRFANG(NRB)
Follows last card of RFANG's	6R10.4	*POR(NRB,J)	Probability of reflecting per unit solid angle into an angle whose cosine is RFANG (NRB,J) (Omit if JREFLT(NRB) = 1 or 3)	J=1, NRFANG(NRB)
Follows last card of POR's		RFLCOS(NRB,J)	Cosine values of reflection angle corresponding to the cumulative reflection distribution for values of J/NRFCOS (NRB). Input the values of RFLCOS in descending order. First cosine is input for probability = 1/NRFCOS(NRB). (Omit if JREFLT = 1 or 3).	J=1, NRFCOS(NRB)

* These values are not used in LITE-II; however, if JRFLT(NRB) equals 2 or 4, some arbitrary values must be input for these values, since the instructions for reading in these items have not been removed from LITE-II.

3.5 Printout Control

Input Group 5 data, which describes the upper bounds of the print angle groups and the print collision numbers, are shown in Table V. The upper bounds of the print angles are given in terms of the cosine of the angles between the source-receiver axis and the direction of the scattered light at the receiver position for LITE-I and in terms of the cosine of the angle between the particle's direction and the normal to the receiver plane for LITE-II. The print collision numbers are the orders of scattering for which scattered light intensities are to be listed. The light intensity from all orders of scattering greater than the previous collision number up to and including the given collision number is listed opposite each print collision number.

TABLE V. Group 5 Input Data (Printout Control)

Card	Format	Input Item	Definition	Limit
1	3I10	LIBRAY	Input group number	=5
		NPCOL	Number of print collisions	≤24
		NPA	Number of print cosines	≤25
2 continues on following cards	6I10	INCOL(J)	Print collision numbers (in ascending order)	J=1, NPCOL
Follows last card of INCOL's	6R10.4	CIPA(J)	Print cosines (descending order)	J=1, NPA

3.6 Detector Locations

Input Group 6 data, which describe the detector locations, are listed in Table VI. In tracing histories with LITE-I, only the height and radius of each collision point are preserved to identify the location of the collisions. The azimuthal angle between a plane containing the source and collision points and a plane containing the source and detector points is selected at random from a uniform distribution between 0 and 2π. To improve the statistics, several azimuthal angles may be selected for a given detector radius and an estimate made of the light intensity scattered to the detector for each azimuthal angle so determined. The intensities at detector points defined by each of these azimuthal angles are averaged to obtain the intensities at a single detector point. The input item NPHID(J) specifies the number of azimuthal positions that will be selected for the jth detector point. In LITE-II only the heights of the collision points are recorded, thus the values input for RD(I) and NPHID(I) are not used in the scattering calculation and may be left blank.

In LITE-I, DBSS(J) is the light intensity per unit source strength emitted per unit solid angle in a direction toward a point located on the jth detector ring. LITE-I calculates the direct beam intensity for the jth detector ring with the expression,

$$DBI = DBSS(J)e^{-RHOT/T^2}$$

where RHOT is the number of optical path lengths between the source and the jth detector point, and

T is the distance from the source point to the jth detector point.

TABLE VI. Group 6 Input Data (Detector Locations)

Card	Format	Input Item	Definition	Limit
1	2I10	LIBRAY	Input [illegible] p number	-6
		NDMAX	Numbe[illegible] detector rings	≤10
2	2R10.4, I10,R10.4	HD(1)	Height of 1st detector ring	
		*RD(1)	Radius of 1st detector ring	
		*NPHID(1)	Number of detector points on 1st ring	
		*DBSS(1)	Direct beam source strength for 1st detector	
3	2R10.4, I10,R10.4	HD(2)	Height of 2nd detector ring	
		*RD(2)	Radius of 2nd detector ring	
		*NPHID(2)	Number of detector points for 2nd ring	
		DBSS(2)	Direct beam source strength for 2nd detector	
A card similar to 2 and 3 is required for each detector ring				
Last card of group 6	2R10.4, I10,R10.4	HD(NDMAX)	Height of last detector ring	
		*RD(NDMAX)	Radius of last detector ring	
		*NPHID (NDMAX)	Number of detector points on last ring	
		*DBSS (NDMAX)	Direct beam source strength for last detector ring	

* The NPHID(J) values are not used by LITE-II, and the RD(J) and DBSS(J) values should be input for LITE-II as discussed in Section 3.6

The equation used for direct-beam calculations in both LITE-I and LITE-II are identical, therefore, the direct-beam calculation is only applicable to plane parallel sources in LITE-II. For a plane parallel source, the values input for RD(J) should be given by the expression

$$RD(J) = (HD(J)-HS)/\cos\theta_o$$

where HD(J) is the height of the Jth receiver plane,

HS is the height of the source, and

$\cos\theta_o$ is the cosine of the angle at which the source is incident upon the slab.

In addition, DBSS(J) should be input as the product of the number of particles emitted per unit area from the source plane times the secant of the source angle times the slant thickness squared, T^2, between the source and receiver plane.

3.7 Geometry Description

Input Group 7 data listed in Table VII provides for the geometry description. An air-ground geometry is defined with region boundaries composed of horizontal planes and right circular vertical cylinders in LITE-I and by horizontal planes in LITE-II. The planes are identified as boundary type 1 and the cylinders as boundary type 2. For boundary type 1, COEE is the H intercept of the plane, and for boundary type 2, COEE is the radius of the cylindrical surface. All reflection surfaces must be assigned boundary numbers less than or equal to 5. A negative sign preceding the boundary number, NBOUND, denotes a reflection boundary. Regions are defined by the signed boundary numbers encompassing the region. In reference to

TABLE VII Group 7 Input Data (Geometry Description)

Card	Format	Input Item	Definition	Limit
1	3I10	LIBRAY	Input group number	=7
		NBMAX	Number of boundaries	≤100
		NRMAX	Number of regions	≤100
2	2I10 R10.4	*NBOUND(1)	Position of boundary 1 in boundary table	
		ITYPE(1)	Type of boundary 1. ITYPE(1) = 1, H plane ITYPE(1) = 2, cylinder	
		COEE(1)	Coefficient of boundary 1	
A card similar to card 2 is required for each boundary.				
Follows last boundary card	3I5, R5.2, 8I5	*NREG(1)	Position of region 1 in region table	
		NB(1)	Number of boundaries encompassing region 1	
		MAT(1)	Phase function number for region 1	
		EMP(1)	Importance number for region 1	
		IB(1,1)	First boundary, bounding region 1 (sign on IB designates inner or outer boundary with respect to region 1)	
		MPR(1,1)	Most probable region of entry across first boundary of region 1	
		IB(1,2)	Second boundary bounding region 1 with appropriate sign	
		MPR(1,2)	Most probable region of entry across second boundary of region 1	
		IB(1,3)	Third boundary bounding region 1 with appropriate sign	
		MPR(1,3)	Most probable region of entry across third boundary of region 1	
		IB(1,4)	Fourth boundary bounding region 1 with appropriate sign	
		MPR(1,4)	Most probable region of entry across fourth boundary of region 1	
A card similar to the preceding card is required for each region including outside regions.				

* Boundaries and regions are assigned numbers sequentially in the order they are listed in the input. The values NBOUND(J) and NREG(J) therefore should both begin with 1 for the first boundary or region listed and increase sequentially for the remaining boundaries or regions

planes, the minus sign denotes a "lower" plane, and the plus sign denotes an "upper" plane. In reference to a cylindrical surface, the minus sign denotes an "inner" surface, and the plus sign denotes an "outer" surface. All space must be identified including outside regions which are not completely encompassed by boundaries. The most probable regions of entry, MPR, are given to speed up the region search process. When there are two or more possible regions of entry across a given boundary, the region with the smallest region number should be given as the most probable region of entry.

The region importance number, EMP, is given to reduce the sampling in regions of minor importance. A particle when crossing from one region to a region of more importance will not be affected by the region importance numbers. However, when a particle crosses from a region to a region of less importance, a random number will be generated and the history terminated if the ratio of the importance numbers (EMP for region entered/EMP for region exited) is less than the random number. If the ratio of the importance numbers is greater than the random number, then the particle weight is multiplied by the reciprocal of the ratio and tracing of the history is continued.

3.8 Mie Scattering Data

The Input Group 8 data listed in Table VIII defines the Mie scattering phase functions to be used in the air-ground geometry. The data shown in Table VIII for Input Group 8 must be repeated for each phase function to be defined. Up to 10 phase functions may be defined in any one problem. MAT is the number assigned to the phase function defined by the data in Input Group 8. This number is used

TABLE VIII Group 8 Input Data (Mie Scattering Data)

Card	Format	Input Item	Definition	Limit
1	2I10	LIBRAY	Input group number	=8
		MAT	Mie scattering phase function number for the following data	≤10
2	2I10 10X,R10.4	NDFCOS (MAT)	Number of cosines for which the Mie scattering phase function are given	≤50
		NPHANG (MAT)	Number of cosines used to describe the cumulative angular distributions for Mie scattering	≤50
		RAYLEE(MAT)	= 1, Rayleigh scattering only = 0, Both Rayleigh and Mie Scattering	
3	6R10.4	*DIFCOS (MAT,J)	Cosine values at which Mie scattering phase functions are listed (descending order) Omit if RAYLEE = 1	J=1, NDFCOS (MAT)
Follows last DIFCOS card	6R10.4	*PDCOS (MAT,J)	Values of the phase function at the designated cosines Omit if RAYLEE = 1 NDFCOS values.	J=1, NDFCOS (MAT)
Follows last PDCOS card	6R10.4	PHANG (MAT,J)	Cosines at equal probability intervals describing cumulative phase function Omit if RAYLEE = 1 (descending order) PHANG(MAT,1) = 1, NPHANG(MAT)	J=1, NPHANG (MAT)

* The values input for DIFCOS(MAT,J) and PDCOS(MAT,J) are not used by LITE-II. However, at least one value must be input for each of these items if RAYLEE(MAT) is less than 1 (The provisions for reading in these values were not removed from LITE-II.)

to designate the phase function for each of the regions defined by the Input Group 7 data.

Special routines have been incorporated into the code for treating Rayleigh scattering, therefore, it is only necessary to input the Mie scattering phase functions. If only Rayleigh scattering is to be considered (RAYLEE = 1.0), then Input Group 8 data defining DIFCOS(MAT,J), PDCOS(MAT,J), and PHANG(MAT,J) may be omitted. When Mie scattering is treated, both the phase function and the cumulative Mie scattering angular distribution must be input.

3.9 Cross Section Input Data

Input Group 9 data give the number of mean-free-path lengths to ground level, the ratio of the scattering-to-total cross section, and the ratio of Rayleigh to scattering cross section as of function of altitude. The scattering cross section is taken to be the sum of the Mie and Rayleigh scattering cross sections. The difference between the extinction coefficient (total cross section) and the scattering cross section is defined as the absorption cross section.

The number of mean-free-path lengths, TAU, from the ground level to height HV is defined by the equation

$$TAU \int_0^{HV} \Sigma_T(h)dh$$

where $\Sigma_T(h)$ is the extinction coefficient as a function of the altitude h.

TABLE IX. Input Group 9 (Cross Section Input Data)

Card	Format	Input Item	Definition	Limit
1	2I10	LIBRAY	Input group number	=9
		NOH	Number of altitudes at which the path lengths from zero to HV are listed	≤100
2* through NOH+1	4R10.4	HV(J)*	Altitude for which cross section data is to be listed	J=1,NOH
		TAU(J)	Number of path lengths from zero to HV(J)	J=1,NOH
		SCATR(J)	Ratio of scattering-to-total cross section for altitude HV(J)	J=1,NOH
		RAYR(J)	Ratio of Rayleigh-to-scattering cross section for altitude HV(J)	J=1,NOH

* Card 2 contains the four items HV(J), TAU(J), SCATR(J), and RAYR(J) for J=1, the same four items for J=2 are on the next cards, and etc.

3.10 Data Print and Check Options

Data for Input Group 10 as given in Table X are contained on a single card. This card gives the problem number and data print and check options. The problem number is printed on output to identify the output data. IDUMP is a print option that allows the printout of intermediate values calculated during the generation of each history. This option is included to aid in checkout The quantity of printout produced when IDUMP is non-zero makes it inadvisable to print the intermediate data if more than ten histories are being processed.

ICHECK is an option that provides for several checks on the input data. The input cumulative probability tables are checked for ascending order, and several of the cosine tables are checked for descending order. In addition, various input values are checked to insure that storage locations reserved for dimensioned variables are not exceeded. Cards within the input data groups 1 through 9 must be arranged in the order specified in Tables I through IX, but it is not necessary to order the groups. The cards for Input Group 10 must be loaded after the cards for all other input groups have been loaded.

3.11 Loading Instructions

The LITE codes are designed to process several problems during any one computer run. The input data for a second problem may be loaded directly behind the input data for Input Group 10 for the previous problem. Furthermore, if any of the input data groups 1 through 9 are identical for two consecutive problems, that input data group may be omitted in the second problem. Each individual problem must contain a card for input Group 10.

TABLE X. Group 10 Input Data (Data Print and Check Options)

Card	Format	Input Item	Definition	Limit
1	4110	LIBRAY	Input group number	=10
		NPROB	Problem number	
		IDUMP	Option for intermediate printout = 0, no intermediate printout = 1, gives intermediate printout	
		ICHECK	Option for checking input data = 0, no check on input data = 1, check input data	

IV. SAMPLE PROBLEMS

The sample problems given in this section for both LITE-I and LITE-II were designed to calculate the angular distribution of the scattered radiation emerging from a Rayleigh atmosphere.

4.1 LITE-I Sample Problem

In order to compute the transmitted intensity through a 0.5 mean-free-path thick Rayleigh atmosphere with a ground albedo of 0.8, the point receivers in the LITE-I problem were placed just slightly above the ground surface at distances 0 50, 150, 300 and 500 units from the vertical axis through the source point. The units selected are arbitrary units, since the atmospheric thickness is measured in terms of optical thicknesses (mean-free-path). The Rayleigh atmosphere was described as being 301 units thick with a cross section varying exponentially according to the expression,

$$\Sigma(h) = 0\ 00625e^{-0.0125h}$$

where h is the altitude in the arbitrary units. Thus the point receivers were located at 0, 0 3125, 0 9375, 1.875 and 3 125 mean-free-paths from the vertical axis through the source point

Table XI lists the input data for the LITE-I sample problem. One thousand (1000) histories were processed in ten groups of 100 histories each A maximum of 20 collisions and 10 reflections were allowed for each history. The source angular distribution was confined to a single angle normal to the upper surface of the atmosphere. The angular distribution of the reflected photon current was input as a cosine distribution to conform to Lambert's law of reflection. The atmosphere was described with three regions separated by two parallel

TABLE XI. LITE-I CODE SAMPLE PROBLEM INPUT DATA

```
         1                                                                  160001    LITE
      1000        10         3         2        20         5               160002    LITE
        20        20        -1         2         1         1               160003    LITE
         2        10     39451     26193     34521     36714               160004    LITE
     36743     87321                                                       160005    LITE
         2                                                                  160006    LITE
 3.000a&02 5.000a&03 1.000a-03 1.000a-02 1.000a-05 1.000a&01               160007    LITE
 1.000a&00                                                                  160008    LITE
         3        -1         2                                            160009    LITE
-1.000a&00-1.000a&00                                                        160010    LITE
 0.000a&00 1.000a&00                                                        160011    LITE
         4         1         2         2        20                        160012    LITE
 8.000a-01                                                                  160013    LITE
 1.000a&00 0.000a&00                                                        160014    LITE
 3.182a&00 0.000a&00                                                        160015    LITE
 9.746a-01 9.487a-01 9.220a-01 8.944a-01 8.660a-01 8.366a-01                160016    LITE
 8.063a-01 7.746a-01 7.416a-01 7.071a-01 6.709a-01 6.325a-01                160017    LITE
 5.915a-01 5.478a-01 5.000a-01 4.472a-01 3.873a-01 3.162a-01                160018    LITE
 2.235a-01 0.000a&00                                                        160019    LITE
         5        20        20                                            160020    LITE
         1         2         3         4         5         6               160021    LITE
         7         8         9        10        11        12               160022    LITE
        13        14        15        16        17        18               160023    LITE
        19        20                                                       160024    LITE
 9.000a-01 8.000a-01 7.000a-01 6.000a-01 5.000a-01 4.000a-01                160025    LITE
 3.000a-01 2.000a-01 1.000a-01 0.000a&00-1.000a-01-2.000a-01                160026    LITE
-3.000a-01-4.000a-01-5.000a-01-6.000a-01-7.000a-01-8.000a-01                160027    LITE
-9.000a-01-1.000a&00                                                        160028    LITE
         6         5                                                       160029    LITE
 1.000a-01 0.000a&00         2 9.000a&04                                    160030    LITE
 1.000a-01 5.000a&01         2 9.250a&04                                    160031    LITE
 1.000a-01 1.500a&02         2 1.125a&05                                    160032    LITE
 1.000a-01 3.000a&02         2 1.800a&05                                    160033    LITE
 1.000a-01 5.000a&02         2 3.400a&05                                    160034    LITE
         7         2         3                                            160035    LITE
        -1         1 0.000a&00                                            160036    LITE
         2         1 3.010a&02                                            160037    LITE
    1    1    1 0.00    1    2                                            160038    LITE
    2    2    1 1.00   -1    1    2    3                                   160039    LITE
    3    1    1 0.00   -2    2                                            160040    LITE
         8         1                                                       160041    LITE
```

TABLE XI. (CON'T)

0	0		1.000@&00	160042	LITE
9	23			160043	LITE
0.00@&00	0.000@&00	1.000@&00	1.000@&00	160044	LITE
5.00@&00	3.000@-02	1.000@&00	1.000@&00	160045	LITE
10.00@&00	5.840@-02	1.000@&00	1.000@&00	160046	LITE
15.00@&00	8.000@-02	1.000@&00	1.000@&00	160047	LITE
20.00@&00	1.090@-01	1.000@&00	1.000@&00	160048	LITE
30.00@&00	1.550@-01	1.000@&00	1.000@&00	160049	LITE
35.00@&00	1.753@-01	1.000@&00	1.000@&00	160050	LITE
40.00@&00	1.960@-01	1.000@&00	1.000@&00	160051	LITE
50.00@&00	2.300@-01	1.000@&00	1.000@&00	160052	LITE
60.00@&00	2.650@-01	1.000@&00	1.000@&00	160053	LITE
70.00@&00	2.950@-01	1.000@&00	1.000@&00	160054	LITE
80.00@&00	3.200@-01	1.000@&00	1.000@&00	160055	LITE
90.00@&00	3.350@-01	1.000@&00	1.000@&00	160056	LITE
10.00@&01	3.550@-01	1.000@&00	1.000@&00	160057	LITE
12.50@&01	3.925@-01	1.000@&00	1.000@&00	160058	LITE
15.00@&01	4.190@-01	1.000@&00	1.000@&00	160059	LITE
17.50@&01	4.410@-01	1.000@&00	1.000@&00	160060	LITE
20.00@&01	4.580@-01	1.000@&00	1.000@&00	160061	LITE
22.50@&01	4.700@-01	1.000@&00	1.000@&00	160062	LITE
25.00@&01	4.740@-01	1.000@&00	1.000@&00	160063	LITE
27.50@&01	4.800@-01	1.000@&00	1.000@&00	160064	LITE
30.00@&01	4.850@-01	1.000@&00	1.000@&00	160065	LITE
50.00@&01	5.000@-01	1.000@&00	1.000@&00	160066	LITE
10	1600	0	0	160067	LITE

planes 301 units apart. The upper and lower regions were given an importance number of zero, so that particles entering these regions would be terminated. The source was located at a height of 300 units above the ground

The output for the LITE-I problem is listed in Table XII The first ten pages of Table XII list the scattered intensity as a function of collision number for each of the receiver points and each of the ten history groups. The eleventh page of Table XII contains averages of the scattered intensities over the ten history groups The twelfth page of Table XII gives the deviations of the group intensities about the average intensities over all the groups.

On the thirteenth page of Table XII, the history termination counters give the number of histories terminated after exceeding the maximum number of collisions allowed, by escaping the atmosphere, and by the particle weight dropping below the input weight cutoff value. The thousand histories produced 11,901 collisions which is an average of 11.901 collisions per history. In pages 14 through 23 of Table XII, the angular distribution of the scattered intensities are given as a function of the order of reflection for each receiver point The cosine values listed on these pages are the cosines of the angle measured from the source-receiver axis for each of the receiver positions Page 24 of Table XII shows the scattered intensities as a function of the region of scatter Page 25 of Table XII gives the reflected intensity at each of the receivers, and the last page of Table XII gives the direct intensity at each of the receivers The units of the intensities computed for the LITE-I sample problem are

(Text continues on page 52.)

TABLE XII. PRINTOUT FOR LITE-I SAMPLE PROBLEM (26 PAGES)

FLUXES FOR DEVIATION GROUP 1.

COLLISIONS	DETECTOR				
	01	02	03	04	05
1	1.5915E-04	2.9079E-06	3.1649E-07	5.2347E-08	1.0050E-08
2	2.7223E-04	5.6773E-06	9.0754E-07	1.4919E-07	2.2987E-08
3	9.0753E-06	2.5210E-06	3.3429E-07	6.0016E-08	1.0528E-08
4	2.1749E-06	3.7205E-06	2.1591E-07	5.5540E-08	1.3477E-08
5	6.0854E-07	9.3268E-07	3.1260E-07	2.2308E-08	9.1502E-09
6	2.1295E-07	1.7499E-07	6.1270E-08	2.6179E-08	5.7906E-09
7	1.1953E-07	1.6004E-07	4.6148E-08	1.7067E-08	4.6969E-09
8	1.1687E-07	5.6076E-08	3.0406E-08	1.2936E-08	1.4107E-09
9	3.1608E-08	3.5035E-08	1.0065E-08	4.2389E-09	1.0679E-09
10	1.3181E-08	7.7206E-09	8.1783E-09	2.2291E-09	1.4944E-09
11	1.1519E-08	8.9931E-08	4.4293E-09	2.5111E-09	5.0244E-10
12	4.7233E-09	5.7698E-09	1.7119E-09	1.2395E-09	2.4915E-10
13	1.5906E-09	1.5224E-09	1.3727E-08	1.6633E-09	2.1755E-10
14	4.5081E-10	5.0917E-10	3.4691E-10	1.0798E-10	8.0257E-11
15	1.7872E-10	2.2183E-10	1.9136E-10	1.4470E-10	8.2913E-11
16	3.3837E-11	2.6671E-11	5.4349E-11	4.8660E-11	4.0202E-10
17	6.0479E-11	7.0804E-11	2.4398E-10	2.1147E-10	1.2421E-11
18	3.2746E-11	9.5842E-11	1.1983E-11	4.2358E-11	8.1339E-11
19	1.3356E-11	8.1652E-12	1.3318E-11	1.2883E-11	2.3357E-11
20	3.6175E-11	4.4462E-11	2.7192E-12	5.8435E-13	2.9595E-13
TOTAL	4.4376E-04	1.6291E-05	2.2636E-06	4.0804E-07	8.2248E-08

BASE FOR RANDOM NUMBER GENERATOR IS 12286841897

FLUXES FOR DEVIATION GROUP 2.

COLLISIONS	DETECTOR				
	01	02	03	04	05
1	2.1951E-04	3.7308E-06	4.1957E-07	6.3246E-08	1.0932E-08
2	6.5634E-04	4.3613E-06	1.0750E-06	1.1402E-07	2.2170E-08
3	1.4046E-04	1.9796E-06	4.7924E-07	7.2467E-08	1.3415E-08
4	1.0513E-06	5.5223E-07	1.5147E-07	6.0964E-08	9.6638E-09
5	2.0546E-07	2.3975E-07	4.1916E-07	5.1055E-08	5.1227E-09
6	7.4387E-08	1.4469E-07	9.3102E-08	1.2566E-08	2.8281E-09
7	4.4211E-08	6.1007E-08	3.2217E-08	2.0327E-08	3.2780E-09
8	3.3336E-08	3.0121E-08	1.5775E-08	7.7831E-09	3.8704E-09
9	1.6190E-08	4.4500E-08	7.0199E-09	6.6398E-09	2.9056E-09
10	3.4025E-08	1.8036E-07	3.4369E-09	1.4792E-09	1.5056E-09
11	1.1273E-08	5.4509E-09	2.1434E-09	7.4027E-10	1.6067E-10
12	2.5674E-09	1.5240E-09	4.5529E-10	3.7546E-10	1.6022E-10
13	1.7173E-09	1.8062E-09	5.7421E-10	3.2076E-10	8.0924E-11
14	2.2236E-10	3.0380E-10	3.2262E-10	4.1732E-11	6.1782E-11
15	1.0872E-09	1.6451E-09	4.2776E-10	1.5164E-10	2.3349E-11
16	3.2701E-10	2.2468E-10	4.1310E-10	2.5429E-11	5.1921E-11
17	3.6631E-10	1.8429E-09	3.6937E-11	1.3679E-11	1.3183E-11
18	1.3421E-10	1.9882E-10	1.6782E-11	1.1900E-11	2.0414E-11
19	1.2502E-10	1.2135E-10	4.2396E-11	8.4250E-12	3.2234E-12
20	9.8828E-12	1.7320E-11	4.7150E-12	7.7383E-12	5.9743E-12
TOTAL	1.0178E-03	1.1338E-05	2.7004E-06	4.1224E-07	7.6273E-08

BASE FOR RANDOM NUMBER GENERATOR IS 40064689449

FLUXES FOR DEVIATION GROUP 3.

COLLISIONS	DETECTOR				
	01	02	03	04	05
1	2.2528E-04	3.5454E-06	4.2040E-07	6.8512E-08	1.2604E-08
2	3.8773E-04	4.9302E-06	4.9555E-07	1.1378E-07	2.0689E-08
3	1.2482E-05	2.6076E-06	1.9461E-07	5.3117E-08	1.2918E-08
4	2.3808E-06	1.1555E-06	1.8032E-06	4.7234E-08	6.4659E-09
5	7.1116E-07	8.4355E-07	1.4348E-07	3.1132E-08	2.4535E-08
6	2.2288E-07	1.4181E-07	4.1543E-08	1.1450E-08	4.7309E-08
7	1.0127E-07	7.4930E-08	3.1064E-08	2.1744E-08	4.7281E-09
8	1.4282E-07	9.4795E-08	5.1057E-08	6.5587E-09	4.5360E-09
9	1.0870E-08	4.3073E-08	2.2291E-08	4.7528E-09	1.7608E-09
10	8.2601E-09	1.4056E-08	1.2948E-08	1.0014E-09	1.1107E-09
11	6.1998E-09	1.1694E-08	3.7860E-09	1.0008E-09	1.5359E-09
12	5.6554E-09	6.0470E-09	4.2038E-08	1.1841E-09	5.1203E-09
13	1.1142E-09	2.7385E-09	1.2098E-09	1.8086E-10	8.1661E-10
14	1.2935E-09	2.0037E-09	8.6700E-10	4.6151E-10	3.0420E-09
15	3.6829E-10	6.3912E-10	2.2745E-10	1.0919E-10	5.1525E-11
16	6.7513E-10	1.3046E-09	5.5673E-10	1.1129E-10	2.2901E-10
17	3.0425E-10	2.2973E-10	1.0053E-10	1.2052E-10	1.2516E-11
18	2.2804E-10	3.1852E-10	9.0187E-11	2.9020E-11	1.7591E-10
19	4.9238E-11	8.8564E-11	2.5051E-10	3.1350E-11	1.9341E-10
20	6.1787E-11	5.5845E-11	2.1426E-10	9.3268E-12	3.7979E-12
TOTAL	6.2909E-04	1.3476E-05	3.2655E-06	3.6252E-07	1.4784E-07

BASE FOR RANDOM NUMBER GENERATOR IS 27609630425

FLUXES FOR DEVIATION GROUP 4.

COLLISIONS	DETECTOR				
	01	02	03	04	05
1	1.3705E-03	4.5090E-06	4.4663E-07	6.8059E-08	1.2157E-08
2	4.7655E-04	4.4809E-06	5.9544E-07	8.7997E-08	1.6469E-08
3	2.4111E-05	1.5444E-06	3.4689E-07	1.8413E-07	1.5516E-08
4	1.6212E-06	6.5290E-07	2.0276E-07	5.4760E-08	2.9907E-08
5	3.2659E-07	2.0907E-07	7.8374E-08	2.0189E-08	4.5149E-09
6	1.2551E-06	5.2103E-07	3.6174E-08	1.1253E-08	4.2881E-09
7	8.6883E-08	6.4357E-08	2.9141E-08	1.1990E-08	7.5178E-09
8	1.2254E-07	1.3199E-07	2.0650E-08	3.5591E-09	7.7460E-10
9	1.5729E-08	2.1516E-08	1.6549E-08	1.9407E-09	3.7526E-09
10	7.1103E-09	6.2154E-09	2.9016E-09	8.5509E-10	9.5854E-10
11	1.7841E-08	1.0166E-08	1.1622E-08	1.1637E-09	5.7854E-10
12	3.7220E-09	2.0362E-09	1.9661E-09	2.6480E-09	4.7521E-10
13	3.7204E-09	6.0067E-09	2.0347E-09	3.0610E-10	1.7210E-10
14	2.7856E-10	2.7418E-10	1.9697E-10	4.3438E-10	1.6488E-10
15	2.7304E-10	3.3364E-10	4.3078E-10	5.4786E-10	4.1012E-11
16	4.8388E-11	5.5111E-11	6.8913E-11	6.3288E-11	1.1993E-10
17	1.1259E-10	2.4112E-10	8.5181E-11	2.6430E-11	3.1688E-11
18	1.2468E-11	1.7954E-11	2.3945E-11	5.3728E-12	9.3919E-11
19	2.7345E-11	3.2638E-11	8.3316E-12	9.2184E-10	1.4890E-11
20	6.2847E-12	6.5842E-12	4.8744E-11	6.9045E-12	2.8863E-12
TOTAL	1.8746E-03	1.2161E-05	1.7920E-06	4.5086E-07	9.7551E-08

BASE FOR RANDOM NUMBER GENERATOR IS 36120537193

A NEGATIVE OR ZERO PATH LENGTH WAS GENERATED, PL=-2.8840E-03

FLUXES FOR DEVIATION GROUP 5.

COLLISIONS	DETECTOR				
	01	02	03	04	05
1	1.1668@-04	3.9334@-06	3.8272@-07	5.4515@-08	8.9547@-09
2	3.7696@-04	5.0138@-06	8.1894@-07	1.0003@-07	3.1901@-08
3	1.0472@-05	2.1562@-06	2.2348@-07	6.4451@-08	1.5129@-08
4	2.5110@-06	7.4494@-07	2.1908@-07	6.6706@-08	2.1035@-08
5	5.9072@-07	3.0042@-07	8.8181@-08	3.2993@-08	1.1743@-08
6	4.1643@-07	2.8058@-07	9.3944@-08	2.5322@-08	2.5021@-09
7	1.8459@-07	1.2557@-07	4.2401@-08	6.7604@-09	2.5307@-09
8	3.7808@-08	2.1321@-08	3.0374@-08	5.3571@-09	2.1826@-09
9	1.3999@-08	2.6765@-08	7.8229@-09	2.1005@-08	1.0189@-09
10	7.6889@-09	6.6672@-08	5.0991@-09	6.5416@-09	6.9197@-10
11	2.5150@-09	2.5749@-09	3.1531@-08	9.4150@-10	7.4563@-10
12	7.1748@-10	1.0402@-09	5.4074@-10	2.8668@-10	1.7152@-10
13	7.2099@-10	4.6977@-10	4.7866@-10	1.6288@-09	1.0065@-10
14	4.7446@-10	5.5572@-10	2.1388@-10	4.4636@-10	2.7901@-11
15	8.7476@-10	1.0430@-10	1.6134@-10	6.8207@-11	1.4971@-11
16	2.7195@-09	2.8310@-10	5.3944@-11	2.8375@-11	3.3234@-11
17	7.6055@-11	1.3687@-11	3.6874@-11	3.2618@-11	1.7311@-10
18	2.8473@-12	2.2817@-12	2.6104@-12	1.1918@-11	9.2343@-12
19	6.5394@-12	7.2647@-12	1.7489@-11	3.3936@-10	6.3543@-11
20	3.0104@-12	2.1654@-12	3.8906@-12	6.1123@-12	1.3692@-11
TOTAL	5.0788@-04	1.2675@-05	1.9451@-06	3.8748@-07	9.9043@-08

BASE FOR RANDOM NUMBER GENERATOR IS 4944023603

A NEGATIVE OR ZERO PATH LENGTH WAS GENERATED, PL=-1.038@-02

FLUXES FOR DEVIATION GROUP 6.

COLLISIONS	DETECTOR				
	01	02	03	04	05
1	1.3263E-04	3.7668E-06	3.7394E-07	5.2970E-08	8.6380E-09
2	7.2642E-04	5.5603E-06	6.1546E-07	1.3070E-07	1.4934E-08
3	9.1895E-05	8.8675E-06	3.8516E-07	7.1736E-08	1.1465E-08
4	3.5452E-06	1.5517E-06	2.9473E-07	4.1438E-08	7.6318E-09
5	1.2269E-06	5.7877E-07	8.9906E-08	2.1883E-08	6.5839E-09
6	3.5706E-07	1.3333E-07	3.9195E-08	2.5783E-08	7.8879E-09
7	5.1862E-08	2.9445E-07	1.7281E-08	9.6285E-09	2.2110E-09
8	1.5693E-08	1.4320E-08	1.3219E-08	6.0299E-09	3.6918E-09
9	2.5015E-08	1.2480E-08	6.4525E-09	2.1195E-09	8.7338E-09
10	6.7458E-09	1.0374E-08	3.5205E-09	2.9210E-09	2.5248E-10
11	5.0284E-09	5.1399E-09	2.6681E-08	6.7769E-10	1.0372E-08
12	1.9542E-09	4.8035E-09	1.0432E-09	4.0464E-09	4.1732E-10
13	2.6712E-09	2.3177E-09	2.3712E-09	1.8836E-09	6.2968E-10
14	4.9333E-10	6.3873E-10	4.1320E-10	1.1914E-09	2.7629E-10
15	5.8577E-10	6.2136E-10	1.3720E-09	5.6082E-10	1.1731E-10
16	1.6521E-10	2.0919E-10	2.5613E-10	6.7394E-10	6.2287E-11
17	4.9206E-10	5.5952E-10	3.7541E-10	1.6767E-09	6.5443E-11
18	4.0565E-10	6.2151E-10	1.3892E-10	1.1131E-10	4.4061E-11
19	1.7246E-10	2.6352E-10	8.7682E-11	2.5356E-10	1.4578E-11
20	1.1259E-10	1.0376E-10	7.4923E-10	8.3857E-12	6.0985E-12
TOTAL	9.5619E-04	2.0805E-05	1.8724E-06	3.7630E-07	8.4034E-08

BASE FOR RANDOM NUMBER GENERATOR IS 33978281611

A NEGATIVE OR ZERO PATH LENGTH WAS GENERATED, PL=-1.219E-02

FLUXES FOR DEVIATION GROUP 7.

COLLISIONS	DETECTOR				
	01	02	03	04	05
1	2.3069@-04	4.0424@-06	4.5723@-07	7.1975@-08	1.3039@-08
2	1.3779@-04	5.9893@-06	7.0027@-07	1.1317@-07	1.6597@-08
3	3.3771@-06	1.9053@-06	5.1033@-07	6.8042@-08	1.2521@-08
4	1.4402@-06	6.5837@-07	2.0963@-07	6.9376@-08	1.0829@-08
5	4.5443@-07	2.6264@-07	8.1901@-08	1.3341@-08	1.8624@-08
6	1.3942@-07	1.9965@-07	3.4194@-08	5.4112@-08	4.2518@-09
7	3.2334@-08	3.3412@-08	9.2997@-08	8.0372@-09	5.1501@-09
8	8.4674@-09	1.0813@-08	6.3437@-09	3.9409@-09	5.9484@-09
9	5.1820@-09	6.5765@-09	1.5014@-08	4.5797@-09	1.2713@-09
10	5.7616@-09	4.7340@-09	2.1102@-09	9.1407@-10	5.0299@-10
11	1.4203@-09	1.6770@-09	1.9488@-09	1.2776@-09	2.6069@-10
12	1.0136@-09	1.4285@-09	4.7596@-09	5.4764@-10	2.4548@-10
13	1.7490@-10	1.4882@-10	3.9141@-10	3.1544@-10	3.4597@-10
14	1.3198@-10	1.2983@-10	1.4947@-10	3.1843@-10	1.1953@-09
15	9.1721@-11	6.9482@-11	2.1375@-10	2.2277@-10	1.2665@-10
16	2.5993@-10	2.0860@-10	5.0359@-11	6.6837@-11	1.1817@-10
17	7.5538@-11	5.1690@-11	3.6812@-11	9.5600@-11	1.8373@-10
18	1.1107@-11	9.3646@-12	8.9752@-12	5.4155@-11	9.8080@-12
19	9.4199@-12	6.4312@-12	3.2100@-12	2.4407@-12	1.0437@-11
20	2.4665@-12	2.1118@-12	1.8379@-12	8.4414@-12	5.2456@-12
TOTAL	3.7395@-04	1.3117@-05	2.1176@-06	4.1040@-07	9.1237@-08

BASE FOR RANDOM NUMBER GENERATOR IS 19965574521

FLUXES FOR DEVIATION GROUP A.

COLLISIONS	DETECTOR 01	02	03	04	05
1	1.8611E-04	4.0205E-06	4.1241E-07	6.1721E-08	1.0636E-08
2	4.7695E-04	4.7821E-06	5.2701E-07	7.1378E-08	2.8992E-08
3	4.3183E-05	4.6511E-06	3.9477E-07	7.0411E-08	2.0063E-08
4	1.3106E-04	1.2390E-06	2.5126E-07	3.7075E-08	1.3812E-08
5	5.7477E-07	2.7193E-07	1.6014E-06	7.7626E-08	3.1164E-09
6	1.1836E-07	9.6979E-08	4.5754E-08	2.6993E-08	5.6149E-09
7	8.5679E-08	1.1898E-07	1.5644E-08	8.6229E-09	2.9048E-09
8	2.2839E-08	1.8888E-08	1.15[illegible]-08	1.6006E-08	2.9225E-09
9	6.4901E-09	7.5716E-09	5.8401E-09	2.6236E-09	2.6313E-09
10	9.5548E-09	6.9853E-09	1.0790E-08	2.2087E-09	6.7512E-10
11	1.4015E-09	1.6598E-09	8.0617E-09	7.8788E-10	1.6731E-10
12	2.8800E-09	3.6024E-09	1.9348E-09	1.3328E-09	2.0119E-10
13	3.7631E-10	2.6316E-10	3.1628E-10	4.3344E-10	6.0789E-10
14	6.2227E-10	6.0147E-10	3.5057E-10	1.0028E-09	1.7033E-10
15	1.4206E-10	1.4656E-10	1.0101E-10	3.5424E-10	8.7873E-10
16	1.1873E-10	8.7905E-11	1.8195E-10	6.4465E-10	2.5478E-11
17	5.5876E-11	6.0866E-11	8.9048E-11	7.1108E-10	4.8889E-11
18	1.0769E-11	1.3268E-11	8.8398E-12	6.4428E-12	3.4007E-11
19	1.1193E-11	9.9016E-12	2.2727E-11	5.5294E-11	5.6406E-12
20	1.8073E-11	2.5401E-11	2.5657E-11	6.7579E-11	3.3265E-11
TOTAL	8.3813E-04	1.5220E-05	3.2875E-06	3.8006E-07	9.3541E-08

BASE FOR RANDOM NUMBER GENERATOR IS 25535587099

FLUXES FOR DEVIATION GROUP 9.

COLLISIONS	DETECTOR				
	01	02	03	04	05
1	1.0132E-03	3.3071E-06	3.6367E-07	5.6773E-08	1.0186E-08
2	6.0482E-04	4.3804E-06	7.7094E-07	9.2274E-08	1.7872E-08
3	9.5366E-05	2.2392E-06	2.6058E-07	3.1753E-07	1.2179E-08
4	2.3177E-06	5.5828E-07	2.3771E-07	7.1796E-08	1.1104E-08
5	3.9714E-07	3.0046E-07	1.6859E-07	3.1968E-08	7.4295E-09
6	3.6374E-07	3.7584E-07	1.3071E-07	2.8440E-08	3.0129E-09
7	7.0809E-08	5.2705E-08	4.1320E-08	3.6615E-08	6.4321E-09
8	4.6096E-08	3.1863E-08	4.3959E-08	1.5019E-08	6.7956E-10
9	1.0973E-08	8.0899E-09	6.9087E-09	5.1493E-09	2.3175E-09
10	8.8731E-09	1.3236E-08	4.1069E-09	2.2339E-09	2.7567E-09
11	3.2647E-09	3.4262E-09	6.8579E-08	4.6768E-09	1.4083E-09
12	8.3425E-10	9.4195E-10	1.2965E-09	3.9407E-10	4.3230E-10
13	1.4811E-09	2.5039E-09	4.8425E-10	4.7174E-10	3.0368E-10
14	2.8807E-10	3.0179E-10	6.0728E-10	5.2686E-10	4.4633E-10
15	6.9104E-11	6.3036E-11	1.4092E-10	3.4029E-10	1.6874E-09
16	4.2637E-10	6.8659E-10	8.9488E-10	6.4669E-10	2.7524E-11
17	3.9722E-11	5.4104E-11	2.3009E-10	8.9880E-11	2.0062E-11
18	2.7279E-10	3.4369E-10	2.3807E-09	7.1626E-11	1.1071E-10
19	1.7137E-09	4.8732E-10	1.5272E-10	3.2899E-11	9.8362E-12
20	1.7812E-11	1.3131E-11	1.5217E-09	4.7579E-12	5.8354E-12
TOTAL	1.7166E-03	1.1276E-05	2.1048E-06	6.6506E-07	7.8421E-08

BASE FOR RANDOM NUMBER GENERATOR IS 12020560659

A NEGATIVE OR ZERO PATH LENGTH WAS GENERATED, PL=-2.5530E-02

FLUXES FOR DEVIATION GROUP 10.

COLLISIONS	DETECTOR				
	01	02	03	04	05
1	1.0101E-03	3.7660E-06	4.2707E-07	6.8542E-08	1.2713E-08
2	2.3448E-04	5.2953E-06	7.7619E-07	9.6327E-08	3.1553E-08
3	5.0653E-06	1.8005E-06	4.1365E-07	9.8397E-08	1.2125E-08
4	1.7676E-06	6.6038E-07	7.0889E-07	5.9295E-08	5.0856E-08
5	5.4119E-07	1.4686E-06	5.1399E-07	4.8020E-08	1.3410E-08
6	1.5065E-07	2.9855E-07	7.5151E-08	6.5793E-08	6.2732E-09
7	3.4972E-08	4.7442E-08	2.9116E-08	7.4752E-09	6.9986E-09
8	3.6703E-08	3.9093E-08	1.5409E-08	7.7765E-09	2.6006E-09
9	9.5163E-09	7.8744E-09	1.5759E-08	3.1575E-09	1.1445E-09
10	1.9592E-09	1.6952E-09	1.9911E-09	2.3410E-09	8.9612E-10
11	2.1001E-09	2.6558E-09	9.9639E-10	1.1069E-09	5.1224E-10
12	1.7280E-09	1.4017E-09	1.1175E-09	1.1422E-09	1.8393E-10
13	1.7473E-10	8.4573E-10	2.0569E-10	1.9317E-09	1.4100E-10
14	4.4229E-10	2.6085E-10	3.3695E-10	6.4900E-11	2.0206E-10
15	9.2372E-11	7.3000E-11	7.0345E-11	1.7266E-10	4.4598E-09
16	8.5566E-11	1.0922E-10	2.1119E-11	1.9453E-11	2.2701E-11
17	1.1922E-11	1.2787E-11	2.6908E-11	7.3819E-11	1.3301E-11
18	6.3604E-11	3.6305E-11	2.9340E-11	7.8562E-12	3.0158E-11
19	2.8785E-11	2.6055E-11	8.5181E-11	1.0057E-11	1.1120E-11
20	2.0035E-12	1.6419E-12	6.1476E-12	3.4533E-11	4.4293E-12
TOTAL	1.2522E-03	1.3391E-05	2.9801E-06	4.6169E-07	1.4415E-07

BASE FOR RANDOM NUMBER GENERATOR IS 66622907867

SCATTERED INTENSITIES VERSUS DETECTOR AND COLLISION NUMBER.

COLLISIONS	DETECTOR				
	01	02	03	04	05
1	4.6638E-04	3.7529E-06	4.0201E-07	6.1866E-08	1.0991E-08
2	4.3503E-04	5.0471E-06	7.2824E-07	1.0689E-07	2.2416E-08
3	4.3551E-05	3.0273E-06	3.5430E-07	1.0603E-07	1.3586E-08
4	1.4987E-05	1.1494E-06	4.2946E-07	5.6418E-08	1.7478E-08
5	5.6369E-07	5.4078E-07	3.4975E-07	3.5051E-08	1.0423E-08
6	3.3110E-07	2.3675E-07	6.5104E-08	2.8789E-08	8.9758E-09
7	8.1214E-08	1.0329E-07	3.7735E-08	1.4827E-08	4.6442E-09
8	5.8318E-08	4.4928E-08	2.3874E-08	8.4967E-09	2.8617E-09
9	1.4557E-08	2.1348E-08	1.1372E-08	5.6206E-09	2.6604E-09
10	1.0316E-08	3.1205E-08	5.5082E-09	2.2725E-09	1.0845E-09
11	6.2562E-09	1.3438E-08	1.5978E-08	1.4884E-09	1.6243E-09
12	2.5801E-09	2.8595E-09	5.6864E-09	1.3197E-09	7.6566E-10
13	1.3742E-09	1.8623E-09	2.1794E-09	9.1357E-10	3.4161E-10
14	4.6976E-10	5.5792E-10	3.8048E-10	4.5964E-10	5.6672E-10
15	3.7630E-10	3.9174E-10	3.3367E-10	2.6724E-10	7.4837E-10
16	4.8597E-10	3.1956E-10	2.5515E-10	2.3286E-10	1.0923E-10
17	1.5948E-10	3.1372E-10	1.2626E-10	3.0518E-10	5.7435E-11
18	1.1742E-10	1.6576E-10	2.7143E-10	3.5196E-11	6.0957E-11
19	2.1571E-10	1.0512E-10	6.8357E-11	1.6681E-10	3.5003E-11
20	2.7008E-11	2.7243E-11	2.5789E-10	1.5436E-11	8.1520E-12
TOTAL	9.6102E-04	1.3975E-05	2.4329E-06	4.3146E-07	9.9438E-08

BASE FOR RANDOM NUMBER GENERATOR IS 66622907867

INTENSITY DEVIATIONS VERSUS DETECTOR AND COLLISION NUMBER.

COLLISIONS	DETECTOR				
	01	02	03	04	05
1	1.4118@-04	1.3101@-07	1.2793@-08	2.1930@-09	4.7399@-10
2	5.7173@-05	1.7118@-07	5.3899@-08	6.6968@-09	1.9130@-09
3	1.4539@-05	6.6797@-07	3.1292@-08	2.5010@-08	8.2238@-10
4	1.2237@-05	2.8943@-07	1.5227@-07	3.5009@-09	4.0924@-09
5	8.3014@-08	1.2543@-07	1.3987@-07	5.7393@-09	2.0464@-09
6	1.0339@-07	3.9851@-08	9.7103@-09	5.3973@-09	4.0730@-09
7	1.3956@-08	2.3489@-08	6.5482@-09	2.8224@-09	5.7046@-10
8	1.4804@-08	1.1811@-08	4.4132@-09	1.3583@-09	5.0788@-10
9	2.4684@-09	4.5482@-09	1.6927@-09	1.6809@-09	6.9660@-10
10	2.6414@-09	1.6700@-08	1.1466@-09	4.9757@-10	2.1321@-10
11	1.6605@-09	8.1297@-09	6.4028@-09	3.7083@-10	9.3303@-10
12	5.0516@-10	6.0483@-10	3.8491@-09	3.5591@-10	4.6037@-10
13	3.4249@-10	5.2103@-10	1.2380@-09	2.2565@-10	7.6900@-11
14	9.7381@-11	1.6072@-10	6.4131@-11	1.1445@-10	2.8026@-10
15	1.0762@-10	1.4742@-10	1.1544@-10	5.3079@-11	4.2368@-10
16	2.4286@-10	1.1804@-10	8.6181@-11	8.7795@-11	3.6429@-11
17	4.9719@-11	1.6884@-10	3.5246@-11	1.5714@-10	1.9869@-11
18	4.2026@-11	6.1784@-11	2.2273@-10	1.0544@-11	1.6152@-11
19	1.5879@-10	4.7010@-11	2.3911@-11	8.6975@-11	1.7477@-11
20	1.0634@-11	9.8050@-12	1.5036@-10	6.1426@-12	2.8397@-12
TOTAL	1.5609@-04	8.6093@-07	1.7301@-07	2.6380@-08	7.7180@-09

BASE FOR RANDOM NUMBER GENERATOR IS 66622907867

RADIATION RESEARCH ASSOCIATES *LITE* PROBLEM 1600

HISTORY TERMINATION COUNTERS.

190 HISTORIES WERE TERMINATED WHEN THE COLLISION NUMBER EXCEEDED 20.
549 HISTORIES WERE TERMINATED BY THE REGION IMPORTANCE PARAMETERS.
257 HISTORIES WERE TERMINATED BY MINIMUM WEIGHT CUTOFF.
0 HISTORIES WERE TERMINATED AFTER MAXIMUM NUMBER OF REFLECTIONS.

11901 COLLISIONS OCCURRED.

PARTICLES TERMINATED IN EACH REGION BY REGION IMPORTANCE PARAMETERS.

REGION	HISTORIES TERMINATED	REGION	HISTORIES TERMINATED	REGION	HISTORIES TERMINATED	REGION	HISTORIES TERMINATED
1	0	2	0	3	549		

RADIATION RESEARCH ASSOCIATES PLITE0 PROBLEM 1600

SCATTERED LIGHT INTENSITY VERSUS ANGLE AND NUMBER OF REFLECTIONS FROM SURFACE 1
SOURCE HEIGHT H= 3.000E+02. DETECTOR COORDINATES HD= 1.000E-01 RD=, 0.0E+00

ANGLE (COSINE)	NUMBER OF REFLECTIONS 0	1	2	3	4	5	6
0.9000	4.7331E-04	4.2383E-05	2.8715E-07	8.5013E-09	8.3196E-11	6.0287E-11	0.0000E+00
0.8000	4.4727E-07	8.8841E-05	1.7592E-07	1.1289E-08	6.7965E-10	5.7428E-12	0.0000E+00
0.7000	4.4381E-07	4.5084E-05	1.2425E-07	7.2154E-09	5.5778E-10	9.4199E-12	7.5083E-12
0.6000	7.2922E-08	6.8838E-05	9.8120E-08	4.9125E-09	1.1602E-09	1.6434E-10	7.2993E-12
0.5000	1.1771E-07	4.0420E-05	1.2330E-07	6.2971E-09	3.8858E-10	9.0703E-11	1.2387E-11
0.4000	8.0966E-08	4.0969E-05	1.3079E-05	8.6074E-09	4.8141E-10	6.6328E-11	2.6700E-11
0.3000	2.0721E-07	5.0474E-05	3.2097E-07	5.4970E-09	1.0656E-09	5.0530E-11	1.2837E-11
0.2000	2.8450E-07	1.0294E-05	1.8214E-07	1.2700E-08	1.2638E-09	4.2169E-10	2.8424E-11
0.1000	2.0266E-07	5.2209E-06	2.5360E-07	2.8383E-08	6.9969E-10	1.5478E-10	7.6809E-12
0.0000	2.3371E-07	2.8481E-05	2.0597E-07	1.2409E-08	9.2007E-10	5.6580E-10	3.2731E-11
-0.1000	0.0000E+00	1.4964E-05	3.4664E-05	2.0606E-08	2.4810E-10	8.6667E-11	2.5802E-11
-0.2000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.3000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.4000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.5000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.6000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.7000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.8000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.9000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-1.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
TOTAL	4.7540E-04	4.3597E-04	4.9515E-05	1.2642E-07	7.5480E-09	1.6763E-09	1.6137E-10

RADIATION RESEARCH ASSOCIATES @LITE@ PROBLEM 1600

SCATTERED LIGHT INTENSITY VERSUS ANGLE AND NUMBER OF REFLECTIONS FROM SURFACE 1
SOURCE HEIGHT H= 3.000@+02. DETECTOR COORDINATES HD= 1.000@-01 RD=, 0.0@+00

ANGLE (COSINE)	NUMBER OF REFLECTIONS 7	8	9	TOTAL
0.9000	0.0000@+00	0.0000@+00	0.0000@+00	5.1599@-04
0.8000	0.0000@+00	0.0000@+00	0.0000@+00	8.9476@-05
0.7000	2.0764@-14	1.3197@-13	0.0000@+00	4.5660@-05
0.6000	0.0000@+00	0.0000@+00	0.0000@+00	6.9016@-05
0.5000	4.8921@-13	0.0000@+00	0.0000@+00	4.0668@-05
0.4000	8.9747@-15	1.6300@-12	0.0000@+00	5.4139@-05
0.3000	1.2583@-12	0.0000@+00	0.0000@+00	5.1009@-05
0.2000	4.0429@-12	0.0000@+00	0.0000@+00	1.0775@-05
0.1000	7.9343@-12	2.8779@-14	0.0000@+00	5.7065@-06
0.0000	3.2531@-12	2.3206@-14	0.0000@+00	2.8934@-05
-0.1000	1.4654@-13	2.3275@-14	1.2010@-13	4.9649@-05
-0.2000	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
-0.3000	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
-0.4000	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
-0.5000	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
-0.6000	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
-0.7000	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
-0.8000	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
-0.9000	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
-1.0000	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
TOTAL	1.7154@-11	1.8372@-12	1.2010@-13	9.6102@-04

RADIATION RESEARCH ASSOCIATES PLITE PROBLEM 1600

SCATTERED LIGHT INTENSITY VERSUS ANGLE AND NUMBER OF REFLECTIONS FROM SURFACE 1
SOURCE HEIGHT H= 3.000E+02. DETECTOR COORDINATES HD= 1.000E-01 RD=, 5.0E+01

ANGLE (COSINE)	NUMBER OF REFLECTIONS 0	1	2	3	4	5	6
0.9000	6.8916E-07	4.9694E-07	4.2884E-08	3.9368E-08	8.33?6E-11	4.4953E-11	3.9400E-12
0.8000	8.6675E-07	4.8584E-07	6.3180E-08	5.6664E-09	8.5825E-10	2.5236E-11	0.0000E+00
0.7000	6.2216E-07	5.2145E-07	5.1192E-08	4.3395E-09	1.0861E-09	1.1274E-11	4.6721E-12
0.6000	6.0420E-07	6.0177E-07	3.7370E-08	6.6751E-09	6.0578E-10	9.0353E-11	5.2093E-12
0.5000	5.7532E-07	6.0737E-07	2.2000E-07	8.7967E-09	3.2988E-10	8.0210E-11	5.1953E-11
0.4000	4.7979E-07	9.4178E-07	2.2293E-07	6.9262E-09	1.8382E-09	5.5500E-10	1.2991E-11
0.3000	2.5111E-07	1.0972E-06	9.0576E-08	5.6175E-09	1.7011E-09	1.2546E-10	1.6301E-11
0.2000	5.6993E-07	1.0192E-06	8.2714E-08	1.7785E-08	7.2783E-10	1.3885E-10	2.0631E-11
0.1000	2.7951E-07	7.2083E-07	3.3043E-07	3.4376E-08	6.7535E-10	7.2944E-11	1.7791E-11
0.0000	4.0018E-06	1.9415E-07	5.8802E-08	1.8716E-08	8.3212E-10	6.2968E-09	6.6577E-12
-0.1000	2.4217E-08	8.1940E-08	3.4049E-08	2.7398E-09	2.8801E-10	3.0986E-10	3.4646E-11
-0.2000	2.7809E-09	6.6781E-07	7.6295E-08	4.8045E-09	3.9106E-10	2.3259E-10	8.9999E-12
-0.3000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.4000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.5000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.6000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.7000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.8000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.9000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-1.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
TOTAL	5.0050E-06	7.4362E-06	1.3604E-06	1.5581E-07	9.4170E-09	7.9836E-09	1.8381E-10

RADIATION RESEARCH ASSOCIATES @LITE@ PROBLEM 1600

SCATTERED LIGHT INTENSITY VERSUS ANGLE AND NUMBER OF REFLECTIONS FROM SURFACE 1
SOURCE HEIGHT H= 3.000@+02. DETECTOR COORDINATES HD= 1.000@-01 RD=, 5.0@+01

ANGLE (COSINE)	NUMBER OF REFLECTIONS 7	8	9	TOTAL
0.9000	0.0000@+00	0.0000@+00	0.0000@+00	1.2685@-06
0.8000	0.0000@+00	0.0000@+00	0.0000@+00	1.4223@-06
0.7000	1.5879@-14	1.1382@-13	0.0000@+00	1.2002@-06
0.6000	0.0000@+00	0.0000@+00	0.0000@+00	1.3007@-06
0.5000	8.4770@-13	0.0000@+00	0.0000@+00	1.4120@-06
0.4000	3.7694@-13	7.7488@-13	0.0000@+00	1.6538@-06
0.3000	8.8376@-13	0.0000@+00	0.0000@+00	1.4463@-06
0.2000	9.5694@-12	7.9973@-15	0.0000@+00	1.6905@-06
0.1000	1.2872@-12	1.1365@-14	1.6391@-14	1.3659@-06
0.0000	8.4431@-13	2.7612@-14	0.0000@+00	3.1882@-07
-0.1000	1.5252@-12	5.5144@-14	0.0000@+00	1.4358@-07
-0.2000	4.2933@-13	6.6000@-15	0.0000@+00	7.5232@-07
-0.3000	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
-0.4000	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
-0.5000	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
-0.6000	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
-0.7000	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
-0.8000	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
-0.9000	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
-1.0000	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
TOTAL	1.5780@-11	9.9741@-13	1.6391@-14	1.3975@-05

RADIATION RESEARCH ASSOCIATES @LITE@ PROBLEM 1600

SCATTERED LIGHT INTENSITY VERSUS ANGLE AND NUMBER OF REFLECTIONS FROM SURFACE 1
SOURCE HEIGHT H= 3.000@+02. DETECTOR COORDINATES HD= 1.000@-01 RD=, 1.5@+02

ANGLE (COSINE)	NUMBER OF REFLECTIONS 0	1	2	3	4	5	6
0.9000	1.1640@-07	5.4551@-08	6.0630@-09	2.4889@-09	8.1840@-10	3.1831@-11	4.4790@-11
0.8000	1.0012@-07	1.2805@-07	1.5995@-08	3.0947@-09	1.7752@-09	3.9832@-11	2.4913@-11
0.7000	1.2464@-07	1.0668@-07	3.0437@-08	2.8497@-09	4.3494@-10	2.1634@-11	3.4983@-12
0.6000	2.0111@-07	1.6061@-07	2.4654@-08	2.7743@-09	2.9634@-10	7.4676@-11	1.0067@-11
0.5000	1.0563@-07	2.4214@-07	2.6327@-08	1.4034@-08	3.3158@-10	7.8086@-11	2.0600@-11
0.4000	7.6635@-08	1.5984@-07	6.2063@-08	6.1864@-09	6.9875@-10	1.1747@-10	5.2661@-12
0.3000	1.5755@-08	3.2656@-08	1.4188@-08	2.5248@-09	2.9702@-09	2.8841@-10	1.2041@-11
0.2000	4.9922@-09	1.7183@-08	1.1954@-08	2.1906@-09	3.3261@-10	3.0805@-11	3.7232@-12
0.1000	6.5235@-09	1.8913@-07	5.9316@-08	7.3626@-10	6.4424@-11	2.8297@-11	8.2378@-12
0.0000	1.8489@-08	3.7384@-08	2.4116@-09	1.5769@-09	9.2986@-11	1.0580@-11	9.6344@-12
-0.1000	3.8500@-09	1.6263@-07	2.6154@-09	4.9490@-09	4.7255@-10	2.1631@-11	6.0455@-12
-0.2000	1.2987@-09	9.2290@-09	9.0230@-09	5.1364@-10	2.2969@-09	1.8959@-11	8.0618@-12
-0.3000	3.2763@-10	8.7825@-09	4.2495@-09	1.0930@-09	2.0881@-10	6.0446@-11	3.8945@-11
-0.4000	5.5642@-11	8.1534@-09	8.3243@-10	4.5844@-10	1.3254@-10	6.7395@-11	1.7873@-12
-0.5000	2.2174@-12	1.1419@-08	4.3238@-10	5.4923@-10	6.6490@-12	1.5106@-12	4.3440@-12
-0.6000	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
-0.7000	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
-0.8000	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
-0.9000	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
-1.0000	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
TOTAL	7.7583@-07	1.3284@-06	2.7056@-07	4.6019@-08	1.0933@-08	8.9156@-10	2.0195@-10

RADIATION RESEARCH ASSOCIATES @LITE@ PROBLEM 1600

SCATTERED LIGHT INTENSITY VERSUS ANGLE AND NUMBER OF REFLECTIONS FROM SURFACE 1
SOURCE HEIGHT H= 3.000@+02. DETECTOR COORDINATES HD= 1.000@-01 RD=, 1.5@+02

ANGLE (COSINE)	NUMBER OF REFLECTIONS 7	8	9	TOTAL
0.9000	0.0000@+00	0.0000@+00	0.0000@+00	1.8040@-07
0.8000	6.8028@-15	8.2873@-14	0.0000@+00	2.4910@-07
0.7000	6.2810@-14	7.6948@-13	0.0000@+00	2.6506@-07
0.6000	1.8770@-13	6.1050@-14	0.0000@+00	3.8953@-07
0.5000	6.4361@-13	3.6285@-15	0.0000@+00	3.8856@-07
0.4000	2.9153@-12	1.9606@-15	4.1708@-16	3.0555@-07
0.3000	9.7605@-12	9.7088@-15	0.0000@+00	6.8405@-08
0.2000	1.3056@-12	1.8529@-13	0.0000@+00	3.6689@-08
0.1000	5.5600@-13	4.5406@-15	0.0000@+00	2.5581@-07
0.0000	1.3606@-11	4.7060@-17	0.0000@+00	5.9989@-08
-0.1000	5.8478@-13	3.4638@-14	0.0000@+00	1.7454@-07
-0.2000	1.5973@-13	2.3134@-14	0.0000@+00	2.2388@-08
-0.3000	1.9102@-13	4.9130@-14	0.0000@+00	1.4761@-08
-0.4000	3.5938@-14	0.0000@+00	0.0000@+00	9.7017@-09
-0.5000	9.4989@-14	3.6076@-13	0.0000@+00	1.2416@-08
-0.6000	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
-0.7000	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
-0.8000	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
-0.9000	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
-1.0000	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
TOTAL	3.0111@-11	1.5862@-12	4.1708@-16	2.4329@-06

RADIATION RESEARCH ASSOCIATES PLITEP PROBLEM 1600

SCATTERED LIGHT INTENSITY VERSUS ANGLE AND NUMBER OF REFLECTIONS FROM SURFACE 1
SOURCE HEIGHT H= 3.000P+02. DETECTOR COORDINATES HD= 1.000P-01 RD=, 3.0P+02

ANGLE (COSINE)	NUMBER OF REFLECTIONS 0	1	2	3	4	5	6
0.9000	5.8022P-08	2.5529P-08	7.6062P-09	7.9495P-10	1.7614P-10	5.6893P-11	9.2453P-11
0.8000	4.3791P-08	3.7307P-08	9.8578P-09	1.4321P-09	3.2453P-10	3.0783P-10	2.2367P-11
0.7000	3.5743P-08	6.7239P-08	1.1280P-08	2.4132P-09	6.1183P-10	6.2115P-11	2.0216P-11
0.6000	7.0538P-09	1.4643P-08	5.3538P-09	1.2254P-09	3.7771P-10	2.3790P-10	2.4425P-11
0.5000	1.9435P-09	9.9879P-09	2.0109P-09	4.1057P-10	3.3374P-10	2.7454P-11	4.7606P-12
0.4000	2.3398P-09	8.4595P-09	9.9295P-10	1.0289P-09	1.1126P-10	2.6731P-11	8.6714P-12
0.3000	1.0046P-09	6.8090P-09	1.6086P-09	3.6719P-10	3.6153P-11	1.5299P-11	1.9956P-12
0.2000	4.1802P-09	2.9357P-09	4.3399P-10	5.8159P-10	2.8895P-11	6.3261P-12	5.4007P-12
0.1000	1.2454P-08	2.3915P-09	2.0991P-09	3.5331P-10	2.8366P-11	6.1435P-12	1.3277P-12
0.0000	7.8688P-10	1.8740P-09	2.5975P-09	4.6299P-11	1.1590P-10	2.2322P-11	7.4558P-12
-0.1000	1.6901P-09	2.4666P-09	5.0809P-10	1.3144P-10	1.0686P-10	9.2200P-11	3.8952P-12
-0.2000	5.0190P-10	9.4179P-10	7.6175P-09	6.4725P-11	1.0315P-10	1.4761P-11	5.1711P-13
-0.3000	7.8770P-10	1.9145P-09	3.7243P-09	2.0468P-10	3.0922P-11	5.7301P-12	1.4371P-12
-0.4000	3.2802P-10	8.2648P-10	8.1085P-10	1.6049P-10	6.7840P-11	7.3898P-12	8.2425P-13
-0.5000	4.6641P-11	2.5665P-10	1.1935P-09	9.9421P-11	7.9499P-11	2.3344P-12	2.4228P-12
-0.6000	1.0071P-09	2.5715P-09	1.9096P-10	7.3672P-11	9.6920P-12	4.1391P-12	1.6351P-12
-0.7000	1.3803P-11	1.9605P-09	4.3004P-10	3.7796P-11	3.6953P-11	2.9349P-12	3.3528P-13
-0.8000	0.0000P+00	7.0864P-15	1.8700P-11	1.9891P-12	1.2350P-13	1.8542P-14	1.1824P-14
-0.9000	0.0000P+00	0.0000P+00	0.0000P+00	0.0000P+00	0.0000P+00	0.0000P+00	0.0000P+00
-1.0000	0.0000P+00	0.0000P+00	0.0000P+00	0.0000P+00	0.0000P+00	0.0000P+00	0.0000P+00
TOTAL	1.7169P-07	1.8811P-07	5.8535P-08	9.4277P-09	2.5796P-09	8.9852P-10	2.0015P-10

RADIATION RESEARCH ASSOCIATES @LITE@ PROBLEM 1600

SCATTERED LIGHT INTENSITY VERSUS ANGLE AND NUMBER OF REFLECTIONS FROM SURFACE 1
SOURCE HEIGHT H= 3.000@+02. DETECTOR COORDINATES HD= 1.000@-01 RD=, 3.0@+02

ANGLE (COSINE)	NUMBER OF REFLECTIONS 7	8	9	TOTAL
0.9000	2.4703@-15	0.0000@+00	0.0000@+00	9.2278@-08
0.8000	1.6417@-13	6.4659@-14	0.0000@+00	9.3043@-08
0.7000	6.5422@-12	2.7610@-14	4.9363@-17	1.1738@-07
0.6000	3.5025@-13	2.6646@-15	0.0000@+00	2.8916@-08
0.5000	1.4718@-12	1.3529@-15	0.0000@+00	1.4720@-08
0.4000	8.1184@-14	1.0924@-19	0.0000@+00	1.2968@-08
0.3000	6.9385@-14	2.7383@-14	0.0000@+00	9.8430@-09
0.2000	1.4174@-13	5.4346@-21	0.0000@+00	8.3722@-09
0.1000	5.9009@-13	9.8856@-17	0.0000@+00	1.7334@-08
0.0000	1.5968@-12	1.1289@-18	0.0000@+00	5.4520@-09
-0.1000	6.5272@-13	0.0000@+00	0.0000@+00	4.9998@-09
-0.2000	2.2995@-12	3.8494@-16	0.0000@+00	9.2467@-09
-0.3000	5.9174@-13	6.1251@-15	0.0000@+00	6.6699@-09
-0.4000	1.2810@-13	2.1555@-13	0.0000@+00	2.2022@-09
-0.5000	4.0561@-14	5.1904@-16	0.0000@+00	1.6805@-09
-0.6000	1.4037@-16	3.1107@-13	0.0000@+00	3.8591@-09
-0.7000	2.3285@-13	5.2845@-23	0.0000@+00	2.4826@-09
-0.8000	0.0000@+00	1.0290@-16	0.0000@+00	2.0850@-11
-0.9000	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
-1.0000	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
TOTAL	1.4956@-11	6.5752@-13	4.9363@-17	4.3146@-07

RADIATION RESEARCH ASSOCIATES @LITE@ PROBLEM 1600

SCATTERED LIGHT INTENSITY VERSUS ANGLE AND NUMBER OF REFLECTIONS FROM SURFACE 1
SOURCE HEIGHT H= 3.000@+02. DETECTOR COORDINATES HD= 1.000@-01 RD=, 5.0@+02

ANGLE (COSINE)	NUMBER OF REFLECTIONS 0	1	2	3	4	5	6
0.9000	1.4329@-08	1.3614@-08	3.6221@-09	8.3011@-10	1.7981@-10	2.8826@-11	1.1257@-11
0.8000	8.1347@-09	1.4524@-08	3.5004@-09	8.8569@-10	1.2207@-10	6.1928@-11	9.0972@-12
0.7000	1.1333@-09	3.6178@-09	1.3607@-09	2.2578@-10	5.8905@-11	3.6296@-11	1.9345@-12
0.6000	5.2080@-10	1.0216@-09	7.9627@-10	2.9995@-10	4.6506@-10	1.0720@-11	5.0194@-12
0.5000	7.9934@-10	4.1664@-09	5.7254@-10	8.6835@-11	1.4626@-11	2.0849@-12	1.0433@-13
0.4000	1.5429@-10	1.1474@-09	1.7143@-09	7.3774@-11	1.1903@-10	3.0665@-12	1.3346@-12
0.3000	2.3284@-10	6.5096@-10	2.7085@-10	1.3818@-10	1.7152@-11	1.5533@-11	2.2603@-13
0.2000	1.5578@-09	3.1797@-10	2.7220@-10	4.2143@-11	1.7717@-10	3.2072@-12	2.6437@-13
0.1000	2.0084@-10	4.7683@-10	1.5752@-10	1.0826@-09	1.5701@-11	7.6559@-13	2.5283@-13
0.0000	1.1664@-10	9.3503@-10	3.7291@-11	1.4847@-11	1.3125@-10	2.9087@-10	1.8039@-12
-0.1000	1.9891@-09	7.3667@-10	2.1479@-10	7.6770@-11	2.6898@-11	5.6463@-12	1.0280@-12
-0.2000	1.2741@-10	2.4297@-10	2.0711@-10	4.8745@-12	2.1442@-11	1.5306@-11	8.1935@-13
-0.3000	1.0081@-11	4.2643@-09	3.8782@-10	2.0191@-11	1.6431@-11	5.7214@-12	1.6492@-11
-0.4000	1.9121@-10	1.6238@-10	4.9815@-10	3.4992@-11	5.0229@-11	4.4355@-12	7.0736@-15
-0.5000	2.6592@-12	2.2987@-09	1.1188@-10	2.8092@-11	1.8858@-12	2.1775@-12	9.6840@-15
-0.6000	1.0881@-12	2.4682@-10	5.5362@-11	6.1474@-12	4.0886@-11	8.6465@-12	1.2750@-13
-0.7000	1.5506@-10	1.1222@-09	5.3460@-11	5.6136@-11	7.4226@-12	1.4575@-12	1.1575@-13
-0.8000	6.1524@-11	1.2333@-10	1.2870@-10	9.6434@-12	5.6155@-12	4.1693@-13	1.7359@-14
-0.9000	0.0000@+00	4.5412@-13	4.6970@-11	1.5847@-11	8.5488@-11	3.4727@-13	2.2726@-12
-1.0000	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
TOTAL	2.9718@-08	4.9669@-08	1.4008@-08	3.9326@-09	1.5571@-09	4.9745@-10	5.2184@-11

RADIATION RESEARCH ASSOCIATES PLITE PROBLEM 1600

SCATTERED LIGHT INTENSITY VERSUS ANGLE AND NUMBER OF REFLECTIONS FROM SURFACE 1
SOURCE HEIGHT H= 3.000E+02. DETECTOR COORDINATES HD= 1.000E-01 RD=, 5.0E+02

ANGLE (COSINE)	NUMBER OF REFLECTIONS 7	8	9	TOTAL
0.9000	7.1545E-14	1.9161E-13	0.0000E+00	3.2615E-08
0.8000	4.8016E-13	6.2178E-15	3.7761E-18	2.7238E-08
0.7000	2.9476E-13	1.4927E-15	0.0000E+00	6.4350E-09
0.6000	1.8750E-13	7.2852E-15	0.0000E+00	3.1196E-09
0.5000	3.2693E-13	4.4871E-14	0.0000E+00	5.6423E-09
0.4000	2.7463E-13	1.0332E-17	0.0000E+00	3.2134E-09
0.3000	1.0108E-13	1.8028E-18	0.0000E+00	1.3258E-09
0.2000	6.6920E-14	0.0000E+00	0.0000E+00	2.3708E-09
0.1000	2.1820E-13	1.1080E-16	0.0000E+00	1.9347E-09
0.0000	1.2199E-16	0.0000E+00	0.0000E+00	1.5277E-09
-0.1000	8.3513E-13	1.0020E-16	0.0000E+00	3.0518E-09
-0.2000	1.0655E-15	9.2856E-18	0.0000E+00	6.1994E-10
-0.3000	1.9660E-16	0.0000E+00	0.0000E+00	4.7210E-09
-0.4000	9.6500E-14	0.0000E+00	0.0000E+00	9.4150E-10
-0.5000	1.7568E-17	0.0000E+00	0.0000E+00	2.4454E-09
-0.6000	2.3282E-13	0.0000E+00	0.0000E+00	3.5931E-10
-0.7000	4.7379E-16	2.0108E-19	0.0000E+00	1.3959E-09
-0.8000	1.1834E-14	0.0000E+00	0.0000E+00	3.2926E-10
-0.9000	5.1657E-23	0.0000E+00	0.0000E+00	1.5138E-10
-1.0000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
TOTAL	3.1999E-12	2.5171E-13	3.7761E-18	9.9438E-08

RADIATION RESEARCH ASSOCIATES @LITE@ PROBLEM 1600

SCATTERED LIGHT INTENSITY VERSUS REGION OF SCATTER

REGION	DETECTOR				
	01	02	03	04	05
1	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
2	9.6102@-04	1.3975@-05	2.4329@-06	4.3146@-07	9.9438@-08
3	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
TOTAL	9.6102@-04	1.3975@-05	2.4329@-06	4.3146@-07	9.9438@-08

LIGHT SCATTERED FROM REFLECTION SURFACES TO EACH DETECTOR.

DETECTOR 1, REFLECTED FLUX = 4.9650-05

DETECTOR 2, REFLECTED FLUX = 1.0820-06

DETECTOR 3, REFLECTED FLUX = 1.5930-08

DETECTOR 4, REFLECTED FLUX = 5.7940-09

DETECTOR 5, REFLECTED FLUX = 9.0520-11

RADIATION RESEARCH ASSOCIATES -LITE- PROBLEM 1600

DIRECT BEAM LIGHT INTENSITIES

DETECTOR	DIRECT INTENSITY
1	6.1648E-01
2	6.1236E-01
3	5.8212E-01
4	5.0418E-01
5	3.9002E-01

photons/unit area per source photon where the unit area is in the arbitrary units used to define the thickness of the atmosphere. If one assumes that the thickness of the atmosphere is 30 KM, then multiplication of the intensities given in Table XII by 10^{-8} would result in intensities that have units of photons cm^{-2} per source photon.

In order to compare the results of this sample problem with transmission data for a normal incident broad beam source, the reflected intensity at each receiver should be subtracted from the total scattered intensity, since the total scattered intensity includes the intensity reflected from the ground surface. The differences should then be plotted as a function of the radial position of the receivers and this radial distribution integrated over the plane containing the detector points to give the transmitted intensity for radiation incident normal to the atmosphere.

4.2 LITE-II Sample Problem

The LITE-II sample problem was designed to calculate the angular distributions of the scattered intensities at several depths in a Rayleigh atmosphere of 0.5 mean-free-path in thickness and with a ground albedo of 0.8, due to a plane source incident at $\theta_o = \cos^{-1}0.6$. Table XIII shows the input data for the LITE-II problem. A total of 2000 histories were divided into ten groups of 200 histories each. A maximum of 20 collisions were allowed for each history. The atmosphere and ground reflection distribution is defined in the same manner as in the sample problem for LITE-I.

Four receiver planes were placed within the atmosphere at altitudes of 0.1, 100, 200 and 299 units above ground level The lower receiver plane is sufficiently close to the lower surface of the atmosphere to record the scattered intensity transmitted through the atmosphere. The upper plane is sufficiently close to the upper surface to record radiation emerging from the top of the atmosphere The output for the LITE-II sample problem shown in Table XIV is in the same format as that previously shown for the LITE-I sample problem.

To obtain the transmitted intensity from the data printed for the first receiver, only those intensities listed for those cosine intervals with lower bounds ranging from -0.1 to -1.0 should be considered. The intensities given for those cosine intervals with lower bounds ranging from 0.9 to 0 0 are mainly comprised of the intensity reflected from the ground surface and would not be transmitted through the lower surface of the atmosphere. The intensities given in Table XIII for the last receiver position that fall in cosine intervals with lower bounds between 0.9 to 0.0 are the intensities emerging from the top surface of the atmosphere. The units of the LITE-II computed intensities are photons/unit area per source photon/unit area, where the unit area is parallel to the top of the atmosphere.

TABLE XIII. LITE-II CODE SAMPLE PROBLEM INPUT DATA

```
         1                                                                  160001    LITE
      2000          10           3           2          20           4     160002    LITE
        20          20          -1           2           1           1     160003    LITE
         2          10       39451       26193       34521       36714     160004    LITE
     36743       87321                                                      160005    LITE
         2                                                                  160006    LITE
 3.000a&02 5.000a&03 1.000a-03 1.000a-02 1.000a-05 1.000a&01                160007    LITE
 1.000a&00                                                                  160008    LITE
         3          -1           2                                         160009    LITE
-6.000a-01-6.000a-01                                                        160010    LITE
 0.000a&00 1.000a&00                                                        160011    LITE
         4           1           2           2          20                 160012    LITE
 8.000a-01                                                                  160013    LITE
 1.000a&00 0.000a&00                                                        160014    LITE
 3.182a-01 0.000a&00                                                        160015    LITE
 9.746a-01 9.487a-01 9.220a-01 8.944a-01 8.660a-01 8.366a-01                160016    LITE
 8.063a-01 7.746a-01 7.416a-01 7.071a-01 6.709a-01 6.325a-01                160017    LITE
 5.915a-01 5.478a-01 5.000a-01 4.472a-01 3.873a-01 3.162a-01                160018    LITE
 2.235a-01 0.000a&00                                                        160019    LITE
         5          20          20                                         160020    LITE
         1           2           3           4           5           6     160021    LITE
         7           8           9          10          11          12     160022    LITE
        13          14          15          16          17          18     160023    LITE
        19          20                                                      160024    LITE
 9.000a-01 8.000a-01 7.000a-01 6.000a-01 5.000a-01 4.000a-01                160025    LITE
 3.000a-01 2.000a-01 1.000a-01 0.000a&00-1.000a-01-2.000a-01                160026    LITE
-3.000a-01-4.000a-01-5.000a-01-6.000a-01-7.000a-01-8.000a-01                160027    LITE
-9.000a-01-1.000a&00                                                        160028    LITE
         6           4                                                      160029    LITE
 1.000a-01 0.000a&00           2 9.000a&04                                  160030    LITE
 1.000a&02 0.000a&00           2 9.000a&04                                  160031    LITE
 2.000a&02 0.000a&00           2 9.000a&04                                  160032    LITE
 2.990a&02 0.000a&00           2 9.000a&04                                  160033    LITE
         7           2           3                                         160034    LITE
        -1           1 0.000a&00                                           160035    LITE
         2           1 3.010a&02                                           160036    LITE
         1     1 0.00    1     2                                           160037    LITE
         2     1 1.00   -1     1     2     3                               160038    LITE
         1     1 0.00   -2     2                                           160039    LITE
         8           1                                                      160040    LITE
         0           0           1.000a&00                                  160041    LITE
         9          23                                                      160042    LITE
```

TABLE XIII. (CON'T)

0.00a£0ᵐ	0.000a£00	1.000a£00	1.000a£00	160043 LITE
5.00a£0ᵐ	3.000a-02	1.000a£00	1.000a£00	160044 LITE
10.00a£0ᵐ	5.840a-02	1.000a£00	1.000a£00	160045 LITE
15.00a£0ᵐ	8.000a-02	1.000a£00	1.000a£00	160046 LITE
20.00a£0ᵐ	1.090a-01	1.000a£00	1.000a£00	160047 LITE
30.00a£0ᵐ	1.550a-01	1.000a£00	1.000a£00	160048 LITE
35.00a£0ᵐ	1.753a-01	1.000a£00	1.000a£00	160049 LITE
40.00a£0ᵐ	1.960a-01	1.000a£00	1.000a£00	160050 LITE
50.00a£0ᵐ	2.300a-01	1.000a£00	1.000a£00	160051 LITE
60.00a£0ᵐ	2.650a-01	1.000a£00	1.000a£00	160052 LITE
70.00a£0ᵐ	2.950a-01	1.000a£00	1.000a£00	160053 LITE
80.00a£00	3.200a-01	1.000a£00	1.000a£00	160054 LITE
90.00a£00	3.350a-01	1.000a£00	1.000a£00	160055 LITE
10.00a£01	3.550a-01	1.000a£00	1.000a£00	160056 LITE
12.50a£01	3.925a-01	1.000a£00	1.000a£00	160057 LITE
15.00a£01	4.190a-01	1.000a£00	1.000a£00	160058 LITE
17.50a£01	4.410a-01	1.000a£00	1.000a£00	160059 LITE
20.00a£01	4.580a-01	1.000a£00	1.000a£00	160060 LITE
22.50a£01	4.700a-01	1.000a£00	1.000a£00	160061 LITE
25.00a£01	4.740a-01	1.000a£00	1.000a£00	160062 LITE
27.50a£01	4.800a-01	1.000a£00	1.000a£00	160063 LITE
30.00a£01	4.850a-01	1.000a£00	1.000a£00	160064 LITE
50.00a£01	5.000a-01	1.000a£00	1.000a£00	160065 LITE
10	1600	0	0	160066 LITE

TABLE XIV. PRINTOUT FOR LITE-II SAMPLE PROBLEM (24 PAGES)

FLUXES FOR DEVIATION GROUP 1.

COLLISIONS	DETECTOR			
	01	02	03	04
1	1.0854E+00	1.0665E+00	8.5695E-01	6.8107E-01
2	8.0560E-01	4.4508E-01	4.0986E-01	3.0106E-01
3	5.1241E-01	3.6971E-01	3.0526E-01	2.6496E-01
4	1.8504E-01	2.3491E-01	1.5774E-01	1.4206E-01
5	1.0975E-01	1.5855E-01	1.3020E-01	1.2497E-01
6	1.0991E-01	9.4155E-02	8.9366E-02	7.3525E-02
7	6.3003E-02	5.7118E-02	3.7767E-02	3.6405E-02
8	3.2604E-02	3.5563E-02	2.3651E-02	2.1011E-02
9	5.3156E-02	1.7361E-02	1.4247E-02	1.2739E-02
10	1.3836E-02	1.1399E-02	8.5186E-03	8.7369E-03
11	1.1817E-02	1.1697E-02	5.9368E-03	5.3795E-03
12	7.4066E-03	3.6823E-03	3.4573E-03	3.1081E-03
13	5.9364E-03	3.2048E-03	2.6831E-03	2.3968E-03
14	4.1722E-03	2.5229E-03	2.0037E-03	1.7990E-03
15	1.4308E-03	1.5317E-03	1.2305E-03	1.0283E-03
16	1.2929E-03	1.0361E-03	8.2141E-04	7.3054E-04
17	4.7562E-04	3.6446E-04	4.0835E-04	4.0114E-04
18	3.9502E-04	2.8876E-04	2.3386E-04	2.1989E-04
19	3.2853E-04	2.4585E-04	1.6585E-04	1.4970E-04
20	7.6570E-05	1.4003E-04	1.1960E-04	1.1175E-04
TOTAL	3.0041E+00	2.5551E+00	2.0506E+00	1.6819E+00

BASE FOR RANDOM NUMBER GENERATOR IS 39177805137

FLUXES FOR DEVIATION GROUP 2.

COLLISIONS	DETECTOR 01	02	03	04
1	1.2345E+00	9.0463E-01	8.6186E-01	5.8398E-01
2	6.4688E-01	4.7448E-01	3.2269E-01	3.0806E-01
3	5.0423E-01	2.5822E-01	2.4620E-01	2.3565E-01
4	2.8637E-01	2.0351E-01	1.4207E-01	1.2786E-01
5	1.6456E-01	1.9543E-01	1.2144E-01	8.4200E-02
6	1.2033E-01	8.6072E-02	5.8836E-02	5.5052E-02
7	8.3676E-02	5.9265E-02	4.2201E-02	4.0500E-02
8	1.0783E-01	4.9787E-02	2.9263E-02	2.8147E-02
9	4.4192E-02	3.5349E-02	2.5945E-02	2.2868E-02
10	2.2106E-02	1.9831E-02	1.0930E-02	9.4496E-03
11	1.8444E-02	8.9556E-03	7.7554E-03	1.4695E-02
12	9.2170E-03	6.6142E-03	6.3368E-03	5.9503E-03
13	5.1866E-03	5.4525E-03	3.5125E-03	3.2112E-03
14	3.5754E-03	3.5671E-03	2.8830E-03	2.6252E-03
15	4.6394E-03	1.7276E-03	1.6003E-03	8.1049E-04
16	1.3841E-03	2.5262E-03	8.2459E-04	7.2399E-04
17	1.1335E-03	1.9734E-03	4.9359E-04	6.3648E-04
18	7.9847E-04	5.6904E-04	4.5373E-04	3.9107E-04
19	4.6070E-04	7.4384E-04	2.4061E-04	2.3777E-04
20	1.3147E-04	4.6693E-04	4.9920E-04	4.1062E-04
TOTAL	3.2597E+00	2.3192E+00	1.6860E+00	1.5276E+00

BASE FOR RANDOM NUMBER GENERATOR IS 64332465745

FLUXES FOR DEVIATION GROUP 3.

COLLISIONS	DETECTOR			
	01	02	03	04
1	1.1799@+00	8.7141@-01	6.6035@-01	6.0880@-01
2	5.3972@-01	4.4410@-01	4.5677@-01	4.1410@-01
3	3.4782@-01	3.0732@-01	3.0213@-01	2.7983@-01
4	2.5732@-01	2.3397@-01	1.3253@-01	1.2876@-01
5	1.2045@-01	1.4427@-01	1.0744@-01	9.5420@-02
6	7.9209@-02	6.0208@-02	5.7985@-02	5.0109@-02
7	7.1533@-02	4.3917@-02	3.1243@-02	2.7370@-02
8	3.7633@-02	2.9056@-02	2.5021@-02	2.3729@-02
9	2.3879@-02	1.2653@-02	1.1363@-02	1.1966@-02
10	1.9507@-02	1.0239@-02	7.9530@-03	8.1298@-03
11	9.0595@-03	8.7947@-03	6.7124@-03	5.9463@-03
12	6.4842@-03	3.9412@-03	3.8062@-03	3.0840@-03
13	3.2987@-03	2.4272@-03	2.4340@-03	4.2365@-03
14	2.6656@-03	1.2034@-03	2.1849@-03	1.4627@-03
15	1.9091@-03	1.1675@-03	8.1676@-04	7.6469@-04
16	1.9183@-03	6.1268@-04	6.3001@-04	5.7671@-04
17	1.0549@-03	6.1471@-04	4.4037@-04	3.5813@-04
18	3.4119@-04	6.2211@-04	4.6821@-04	4.1649@-04
19	2.5225@-04	2.5545@-04	1.4077@-04	1.2677@-04
20	3.4363@-04	1.2878@-04	1.0135@-04	1.0708@-04
TOTAL	2.7043@+00	2.1769@+00	1.8105@+00	1.8653@+00

BASE FOR RANDOM NUMBER GENERATOR IS 58724308995

FLUXES FOR DEVIATION GROUP 4.

COLLISIONS	DETECTOR			
	C1	C2	C3	C4
1	1.1030E+00	1.0121E+00	8.5907E-01	6.8307E-01
2	5.4642E-01	4.2677E-01	5.6260E-01	3.5792E-01
3	5.0716E-01	3.0806E-01	2.3261E-01	2.0359E-01
4	2.1906E-01	2.1540E-01	1.5780E-01	1.5247E-01
5	1.3296E-01	1.2589E-01	9.8436E-02	9.7558E-02
6	8.8271E-02	1.0037E-01	6.6010E-02	6.3189E-02
7	5.5914E-02	5.9972E-02	3.9425E-02	3.6414E-02
8	4.0857E-02	3.3156E-02	2.4172E-02	2.2358E-02
9	2.6426E-02	1.3100E-02	1.0553E-02	9.9087E-03
10	2.0241E-02	1.1089E-02	7.5054E-03	7.0162E-03
11	7.6152E-03	9.3026E-03	7.9717E-03	7.0270E-03
12	9.6053E-03	3.5367E-03	2.2628E-03	1.9434E-03
13	5.5056E-03	3.7177E-03	4.5772E-03	3.4957E-03
14	4.3535E-03	2.6994E-03	2.5720E-03	2.7931E-03
15	2.9285E-03	1.3905E-03	1.4219E-03	1.3629E-03
16	1.0169E-03	7.4565E-04	9.7013E-04	8.9266E-04
17	6.2802E-04	6.5961E-04	1.2268E-03	8.5865E-04
18	7.1478E-04	1.8443E-04	1.6407E-04	1.7605E-04
19	3.6653E-04	2.7279E-04	2.4619E-04	2.3481E-04
20	2.0780E-04	9.4429E-05	7.0749E-05	6.4461E-05
TOTAL	2.7733E+00	2.3285E+00	2.0797E+00	1.4923E+00

BASE FOR RANDOM NUMBER GENERATOR IS 67684980393

FLUXES FOR DEVIATION GROUP 5.

COLLISIONS	DETECTOR			
	01	02	03	04
1	1.0981@+00	7.820@@-01	6.5630@-01	6.1162@-01
2	6.8319@-01	3.9888@-01	4.8347@-01	3.9157@-01
3	3.8906@-01	3.2332@-01	3.1560@-01	2.9477@-01
4	2.0789@-01	1.8700@-01	1.3832@-01	1.3859@-01
5	1.4616@-01	1.3311@-01	1.0077@-01	8.7472@-02
6	7.6811@-02	8.3185@-02	7.4029@-02	5.9534@-02
7	6.7456@-02	4.3619@-02	3.4834@-02	3.2401@-02
8	4.6671@-02	3.6999@-02	3.0860@-02	2.7006@-02
9	2.5459@-02	1.4910@-02	1.2689@-02	1.0687@-02
10	2.2081@-02	1.2156@-02	9.9607@-03	9.5695@-03
11	1.1960@-02	9.6265@-03	7.0373@-03	6.7747@-03
12	5.2233@-03	1.0374@-02	6.8388@-03	6.7896@-03
13	4.7973@-03	4.4135@-03	3.0435@-03	2.7512@-03
14	1.6800@-02	3.3833@-03	1.8502@-03	1.9432@-03
15	1.2556@-03	1.6498@-03	2.2574@-03	1.9782@-03
16	1.8065@-03	6.5279@-04	6.9972@-04	5.8885@-04
17	1.0036@-03	9.2481@-04	6.9123@-04	7.9605@-04
18	1.0173@-03	1.2957@-04	2.6861@-04	2.4533@-04
19	1.1060@-03	5.1008@-04	5.4437@-04	5.1327@-04
20	4.0202@-04	1.5036@-04	1.0657@-04	9.0498@-05
TOTAL	2.8083@+00	2.0410@+00	1.8802@+00	1.8150@+00

BASE FOR RANDOM NUMBER GENERATOR IS 50915447297

FLUXES FOR DEVIATION GROUP 6.

COLLISIONS	DETECTOR			
	01	02	03	04
1	1.1027E+00	7.7152E-01	6.8969E-01	6.3673E-01
2	6.0242E-01	5.4007E-01	3.8690E-01	3.3245E-01
3	3.5863E-01	2.6816E-01	2.4077E-01	2.3490E-01
4	2.6474E-01	1.8743E-01	1.7488E-01	1.3181E-01
5	1.5041E-01	1.1075E-01	1.1242E-01	1.0158E-01
6	1.4943E-01	8.3675E-02	7.7476E-02	7.3415E-02
7	5.3175E-02	5.3230E-02	5.1642E-02	4.4634E-02
8	3.4153E-02	2.7517E-02	2.6604E-02	2.2219E-02
9	2.2221E-02	2.0793E-02	1.5960E-02	1.4580E-02
10	1.2676E-02	1.3679E-02	1.2021E-02	1.1348E-02
11	9.8610E-03	8.5385E-03	6.4912E-03	5.7683E-03
12	5.1325E-03	5.3740E-03	5.7633E-03	5.3201E-03
13	6.7736E-03	2.6791E-03	1.7399E-03	1.2438E-03
14	2.3592E-03	1.6095E-03	9.9677E-04	9.3746E-04
15	2.3668E-03	1.0276E-03	8.5368E-04	8.2862E-04
16	1.4553E-03	5.9963E-04	6.9840E-04	6.9038E-04
17	6.4220E-04	6.4643E-04	4.2748E-04	4.1500E-04
18	3.3166E-04	2.4715E-04	1.6303E-04	1.5525E-04
19	2.6293E-04	1.9064E-04	1.5642E-04	1.5864E-04
20	7.4361E-05	1.4061E-04	1.6458E-04	8.4232E-05
TOTAL	2.7796E+00	2.1179E+00	1.8062E+00	1.6193E+00

BASE FOR RANDOM NUMBER GENERATOR IS 55868853539

FLUXES FOR DEVIATION GROUP 7.

COLLISIONS	DETECTOR			
	01	02	03	04
1	1.1852@+00	7.5180@-01	7.8848@-01	6.8875@-01
2	6.7020@-01	4.1025@-01	4.2490@-01	3.5884@-01
3	3.3186@-01	2.0997@-01	2.7619@-01	2.1293@-01
4	2.9957@-01	2.1304@-01	1.6840@-01	1.3798@-01
5	1.5746@-01	1.2193@-01	1.0883@-01	9.2992@-02
6	1.0419@-01	9.5116@-02	7.4992@-02	6.3855@-02
7	4.1654@-02	5.8618@-02	4.9428@-02	5.0177@-02
8	3.8483@-02	3.3665@-02	2.3953@-02	2.3978@-02
9	3.1594@-02	1.6260@-02	1.2773@-02	1.1521@-02
10	1.5972@-02	1.4275@-02	9.8596@-03	8.4662@-03
11	7.6240@-03	1.0807@-02	6.1546@-03	6.3387@-03
12	5.2274@-03	6.0898@-03	4.7998@-03	4.2372@-03
13	4.4444@-03	2.2627@-03	2.7952@-03	2.6953@-03
14	2.0090@-03	2.9886@-03	2.1380@-03	2.2079@-03
15	2.2734@-03	1.1124@-03	7.5509@-04	7.0694@-04
16	9.8149@-04	4.9617@-04	4.8890@-04	4.7634@-04
17	1.1703@-03	5.1565@-04	3.9606@-04	3.7647@-04
18	3.5547@-04	3.3537@-04	2.7791@-04	2.6203@-04
19	2.7104@-04	1.9796@-04	2.0933@-04	2.2063@-04
20	1.3706@-04	9.7050@-05	1.4536@-04	1.4279@-04
TOTAL	2.9007@+00	2.0598@+00	1.9560@+00	1.8671@+00

BASE FOR RANDOM NUMBER GENERATOR IS 22882805977

FLUXES FOR DEVIATION GROUP 8.

COLLISIONS	DETECTOR			
	01	02	03	04
1	1.2796@+00	6.8579@-01	5.4792@-01	5.4762@-01
2	6.1675@-01	4.2408@-01	3.1852@-01	3.1015@-01
3	4.5067@-01	2.9239@-01	2.4242@-01	2.4067@-01
4	2.4821@-01	2.1223@-01	1.6828@-01	2.0547@-01
5	1.6307@-01	1.3123@-01	1.1999@-01	9.4179@-02
6	9.5231@-02	9.6095@-02	6.6002@-02	6.1281@-02
7	4.9887@-02	5.5016@-02	4.9902@-02	4.0383@-02
8	3.3839@-02	3.5008@-02	2.3078@-02	1.9920@-02
9	2.2990@-02	1.7001@-02	1.2616@-02	1.1176@-02
10	1.5619@-02	1.5170@-02	1.1376@-02	1.1230@-02
11	6.6540@-03	8.2615@-03	6.9810@-03	5.9605@-03
12	7.9766@-03	1.0219@-02	5.6892@-03	6.4531@-03
13	3.5950@-03	8.5378@-03	7.1107@-03	4.7791@-03
14	2.9077@-03	2.1000@-03	1.3682@-03	1.9408@-03
15	1.1006@-03	1.0192@-03	9.9299@-04	1.7402@-03
16	4.7139@-04	8.3451@-04	6.4902@-04	5.1290@-04
17	2.2210@-04	6.0292@-04	4.4331@-04	4.0546@-04
18	2.1767@-04	2.5798@-04	2.0397@-04	1.9902@-04
19	2.1449@-04	1.2040@-04	1.1142@-04	1.0656@-04
20	9.0662@-05	1.2769@-04	7.3307@-05	6.1225@-05
TOTAL	2.9994@+00	1.9961@+00	1.5837@+00	1.5642@+00

BASE FOR RANDOM NUMBER GENERATOR IS 67301579371

FLUXES FOR DEVIATION GROUP 9.

COLLISIONS	DETECTOR			
	01	02	03	04
1	9.4016E-01	8.1060E-01	6.8885E-01	6.0998E-01
2	6.5936E-01	7.0939E-01	4.0878E-01	3.6486E-01
3	3.1145E-01	2.9076E-01	2.5212E-01	1.9225E-01
4	2.4115E-01	1.8904E-01	1.6204E-01	1.4309E-01
5	2.8315E-01	1.4859E-01	8.2515E-02	7.4065E-02
6	8.8991E-02	7.5025E-02	5.6120E-02	4.5772E-02
7	8.9503E-02	5.9113E-02	3.8576E-02	3.5560E-02
8	6.9164E-02	3.6702E-02	2.7009E-02	2.3349E-02
9	3.5150E-02	1.8995E-02	1.7487E-02	1.3307E-02
10	1.7793E-02	1.3840E-02	8.0407E-03	7.0483E-03
11	1.4564E-02	8.7793E-03	7.2034E-03	6.0797E-03
12	5.4651E-03	8.6302E-03	1.8304E-02	4.5042E-03
13	8.4426E-03	2.7804E-03	3.6438E-03	3.4887E-03
14	2.3746E-03	3.0485E-03	2.0735E-03	2.1344E-03
15	4.2023E-03	1.4716E-03	8.7281E-04	8.3291E-04
16	3.9507E-03	1.9587E-03	1.3115E-03	1.2604E-03
17	1.1175E-03	1.3205E-03	4.5205E-04	4.2260E-04
18	1.0060E-03	4.1158E-04	4.3787E-04	4.1293E-04
19	6.8422E-04	5.4857E-04	4.9630E-04	4.7638E-04
20	9.9600E-05	4.9626E-04	2.9866E-04	2.7004E-04
TOTAL	2.7778E+00	2.3765E+00	1.7766E+00	1.6221E+00

BASE FOR RANDOM NUMBER GENERATOR IS 20960844731

FLUXES FOR DEVIATION GROUP 10.

COLLISIONS	DETECTOR			
	01	02	03	04
1	1.0077@+00	7.5566@-01	6.1336@-01	5.5816@-01
2	5.9094@-01	6.0792@-01	3.5142@-01	3.0757@-01
3	5.6225@-01	3.0677@-01	2.3511@-01	2.0411@-01
4	2.5055@-01	2.0457@-01	1.5941@-01	1.5390@-01
5	1.4843@-01	1.2040@-01	1.0463@-01	9.0539@-02
6	9.9415@-02	8.0204@-02	7.2154@-02	5.5849@-02
7	6.7173@-02	5.3990@-02	3.2594@-02	3.2345@-02
8	7.0063@-02	3.0823@-02	3.2611@-02	2.8644@-02
9	3.6609@-02	2.3760@-02	2.1650@-02	1.9126@-02
10	2.7800@-02	1.5945@-02	1.1969@-02	9.4000@-03
11	1.0546@-02	1.2827@-02	1.0207@-02	9.8853@-03
12	9.3749@-03	8.3145@-03	4.3603@-03	4.0288@-03
13	8.0213@-03	4.4101@-03	3.6348@-03	3.4925@-03
14	2.9576@-03	3.7043@-03	1.9144@-03	2.0120@-03
15	2.3294@-03	1.7097@-03	1.4187@-03	1.3940@-03
16	1.2603@-03	1.0806@-03	9.7078@-04	9.0139@-04
17	6.7369@-04	7.6762@-04	6.9912@-04	4.8650@-04
18	6.1348@-04	4.6234@-04	8.6977@-04	6.6236@-04
19	3.1644@-04	1.5973@-04	1.5615@-04	6.1207@-04
20	4.9201@-04	1.9449@-04	1.3966@-04	1.3238@-04
TOTAL	2.8976@+00	2.2499@+00	1.6595@+00	1.4830@+00

BASE FOR RANDOM NUMBER GENERATOR IS 4258861A169

SCATTERED INTENSITIES VERSUS DETECTOR AND COLLISION NUMBER.

COLLISIONS	DETECTOR			
	01	02	03	04
1	1.1216E+00	8.4623E-01	7.2228E-01	6.4998E-01
2	6.3615E-01	4.6810E-01	4.1259E-01	3.4466E-01
3	4.2756E-01	3.0547E-01	2.6484E-01	2.3337E-01
4	2.4599E-01	2.0811E-01	1.5615E-01	1.4620E-01
5	1.5765E-01	1.3902E-01	1.0867E-01	9.4498E-02
6	1.0116E-01	8.6511E-02	6.9297E-02	6.0158E-02
7	6.4298E-02	5.4386E-02	4.0781E-02	3.7619E-02
8	5.1132E-02	3.4427E-02	2.6642E-02	2.4036E-02
9	3.2167E-02	1.8810E-02	1.5548E-02	1.3788E-02
10	1.8763E-02	1.3763E-02	9.8134E-03	9.0795E-03
11	1.0814E-02	9.7591E-03	7.2451E-03	7.6355E-03
12	7.1117E-03	6.6776E-03	6.1638E-03	4.5419E-03
13	5.6002E-03	3.9886E-03	3.5175E-03	3.1791E-03
14	4.4174E-03	2.6827E-03	2.0005E-03	1.9856E-03
15	2.4436E-03	1.3808E-03	1.2220E-03	1.0747E-03
16	1.5558E-03	1.0547E-03	8.0644E-04	7.3541E-04
17	8.1215E-04	8.4103E-04	5.6784E-04	5.1565E-04
18	5.7913E-04	3.5086E-04	3.5610E-04	3.1404E-04
19	4.2671E-04	3.2453E-04	2.4714E-04	2.2366E-04
20	2.0552E-04	2.0566E-04	1.7190E-04	1.4771E-04
TOTAL	2.8905E+00	2.2221E+00	1.8489E+00	1.6338E+00

BASE FOR RANDOM NUMBER GENERATOR IS 42588618169

INTENSITY DEVIATIONS VERSUS DETECTOR AND COLLISION NUMBER.

COLLISIONS	DETECTOR			
	01	02	03	04
1	3.0598@-02	3.7190@-02	3.3667@-02	2.3707@-02
2	2.3162@-02	3.0311@-02	2.2580@-02	1.1732@-02
3	2.7077@-02	1.0289@-02	9.6142@-03	7.9753@-03
4	1.0451@-02	5.2459@-03	4.2104@-03	6.7907@-03
5	1.4277@-02	7.3409@-03	4.0472@-03	3.4756@-03
6	6.4889@-03	3.4674@-03	3.1070@-03	2.7047@-03
7	4.4694@-03	1.8170@-03	2.2169@-03	1.0751@-03
8	7.2743@-03	1.9004@-03	9.9024@-04	8.0293@-04
9	3.0722@-03	2.0096@-03	1.4845@-03	1.2363@-03
10	1.3657@-03	8.4605@-04	5.1809@-04	4.5151@-04
11	1.0767@-03	4.5559@-04	3.6645@-04	1.0146@-03
12	5.5466@-04	7.8147@-04	1.3466@-03	4.7523@-04
13	5.1874@-04	5.6985@-04	4.4542@-04	2.0577@-04
14	1.3258@-03	2.4999@-04	1.6050@-04	1.5950@-04
15	3.5671@-04	8.3965@-05	1.4093@-04	1.0448@-04
16	2.8125@-04	2.0003@-04	6.9943@-05	7.0238@-05
17	9.8172@-05	1.4260@-04	7.6945@-05	5.4768@-05
18	8.7994@-05	4.4732@-05	6.6301@-05	4.7043@-05
19	8.2476@-05	6.1369@-05	4.5209@-05	5.4382@-05
20	4.5626@-05	4.5983@-05	3.9613@-05	3.2966@-05
TOTAL	4.9123@-02	5.2855@-02	4.7164@-02	3.1619@-02

BASE FOR RANDOM NUMBER GENERATOR IS 42588619169

RADIATION RESEARCH ASSOCIATES *LITE* PROBLEM 1600

HISTORY TERMINATION COUNTERS.

617 HISTORIES WERE TERMINATED WHEN THE COLLISION NUMBER EXCEEDED 20.
1175 HISTORIES WERE TERMINATED BY THE REGION IMPORTANCE PARAMETERS.
208 HISTORIES WERE TERMINATED BY MINIMUM WEIGHT CUTOFF.
0 HISTORIES WERE TERMINATED AFTER MAXIMUM NUMBER OF REFLECTIONS.

25661 COLLISIONS OCCURRED.

PARTICLES TERMINATED IN EACH REGION BY REGION IMPORTANCE PARAMETERS.

REGION	HISTORIES TERMINATED	REGION	HISTORIES TERMINATED	REGION	HISTORIES TERMINATED	REGION	HISTORIES TERMINATED
1	1	2	0	3	1174		

RADIATION RESEARCH ASSOCIATES ELITE PROBLEM 1600

SCATTERED LIGHT INTENSITY VERSUS ANGLE AND NUMBER OF REFLECTIONS FROM SURFACE 1
SOURCE HEIGHT H= 3.000E+02. DETECTOR COORDINATES HD= 1.000E-01 RD= 0.0E+00

ANGLE	NUMBER OF REFLECTIONS						
(COSINE)	0	1	2	3	4	5	6
0.9000	0.0000E+00	1.1811E-01	2.7495E-02	6.5642E-03	1.5955E-03	2.3837E-04	3.4866E-05
0.8000	0.0000E+00	1.1655E-01	2.8665E-02	7.5017E-03	1.3716E-03	3.2374E-04	7.8351E-05
0.7000	0.0000E+00	9.6671E-02	2.7526E-02	5.0349E-03	1.6364E-03	2.3987E-04	9.1976E-05
0.6000	0.0000E+00	1.2365E-01	2.5756E-02	6.3411E-03	1.3578E-03	4.0802E-04	1.0326E-04
0.5000	0.0000E+00	1.2489E-01	2.7135E-02	6.2789E-03	1.6205E-03	4.5720E-04	1.5592E-04
0.4000	1.0371E-03	1.0294E-01	2.9734E-02	7.7555E-03	1.2499E-03	3.9810E-04	8.4970E-05
0.3000	1.3605E-03	1.0105E-01	2.4831E-02	6.7836E-03	1.0781E-03	3.5742E-04	1.0937E-04
0.2000	0.0000E+00	1.2207E-01	2.1799E-02	3.1676E-03	9.7747E-04	3.5225E-04	3.7146E-05
0.1000	0.0000E+00	6.0197E-02	2.0694E-02	4.5632E-03	9.7094E-04	5.1394E-04	1.8766E-05
0.0000	0.0000E+00	3.2727E-01	5.5124E-02	9.0736E-03	5.0460E-03	1.2204E-03	1.5163E-04
-0.1000	5.7163E-02	9.5776E-02	1.5023E-02	2.6965E-03	9.0450E-04	3.4990E-04	1.2976E-05
-0.2000	7.5545E-02	7.0838E-02	1.3948E-02	3.9020E-03	8.9122E-04	1.9577E-04	8.9245E-05
-0.3000	8.3357E-02	5.6280E-02	1.1005E-02	3.1217E-03	7.5126E-04	4.6772E-04	4.2606E-05
-0.4000	7.2539E-02	4.2817E-02	1.2110E-02	2.2287E-03	5.7836E-04	7.1271E-05	2.3552E-05
-0.5000	7.5920E-02	4.3666E-02	1.0090E-02	1.6725E-03	6.2702E-04	1.2108E-04	1.9652E-05
-0.6000	6.0506E-02	3.7506E-02	8.3661E-03	2.3191E-03	5.3517E-04	1.6013E-04	2.0357E-05
-0.7000	4.7625E-02	3.2167E-02	9.4785E-03	1.9718E-03	3.4996E-04	7.1634E-05	1.5188E-05
-0.8000	5.9622E-02	2.8429E-02	6.7285E-03	1.6689E-03	3.4013E-04	1.0427E-04	2.0428E-05
-0.9000	4.7800E-02	2.5422E-02	7.5475E-03	1.3502E-03	4.4734E-04	6.6426E-05	1.4088E-05
-1.0000	3.8209E-02	2.6174E-02	4.8920E-03	1.4160E-03	2.8894E-04	5.5640E-05	2.3549E-05
TOTAL	6.3071E-01	1.7545E+00	3.8695E-01	8.4212E-02	2.2618E-02	6.1732E-03	1.1479E-03

RADIATION RESEARCH ASSOCIATES *LITE* PROBLEM 1600

SCATTERED LIGHT INTENSITY VERSUS ANGLE AND NUMBER OF REFLECTIONS FROM SURFACE 1
SOURCE HEIGHT H= 5.0000+02. DETECTOR COORDINATES HD= 1.0000-01 RD= 0.0+00

ANGLE (COSINE)	NUMBER OF REFLECTIONS 7	8	9	TOTAL
0.9000	1.4663*-05	2.9073*-06	0.0000*+00	1.5405*-01
0.8000	1.2315*-05	1.6795*-06	0.0000*+00	1.5450*-01
0.7000	2.1961*-05	7.5790*-07	0.0000*+00	1.3412*-01
0.6000	1.6101*-05	4.4925*-07	0.0000*+00	1.5864*-01
0.5000	2.6386*-06	3.8401*-06	0.0000*+00	1.6055*-01
0.4000	1.3453*-05	9.8192*-08	0.0000*+00	1.6321*-01
0.3000	3.9143*-05	1.0923*-06	0.0000*+00	1.3564*-01
0.2000	4.4131*-06	0.0000*+00	0.0000*+00	1.4841*-01
0.1000	3.1260*-06	1.4872*-07	0.0000*+00	8.6961*-02
0.0000	5.3184*-06	0.0000*+00	0.0000*+00	3.9789*-01
-0.1000	2.9052*-09	1.0242*-07	0.0000*+00	1.8193*-01
-0.2000	6.7405*-06	5.4507*-08	0.0000*+00	1.6544*-01
-0.3000	9.1378*-06	0.0000*+00	0.0000*+00	1.5503*-01
-0.4000	5.4751*-06	3.5905*-09	0.0000*+00	1.3037*-01
-0.5000	8.1913*-06	0.0000*+00	0.0000*+00	1.3213*-01
-0.6000	6.2343*-07	5.6471*-07	0.0000*+00	1.0942*-01
-0.7000	4.6074*-06	0.0000*+00	0.0000*+00	9.1583*-02
-0.8000	8.0304*-07	2.1965*-07	0.0000*+00	9.6914*-02
-0.9000	2.1120*-06	3.4821*-08	0.0000*+00	8.2650*-02
-1.0000	1.0276*-06	0.0000*+00	0.0000*+00	7.1062*-02
TOTAL	1.7387*-04	1.1953*-05	0.0000*+00	2.8905*+00

RADIATION RESEARCH ASSOCIATES ÆLITE@ PROBLEM 1600

SCATTERED LIGHT INTENSITY VERSUS ANGLE AND NUMBER OF REFLECTIONS FROM SURFACE 1
SOURCE HEIGHT H= 3.000@+02. DETECTOR COORDINATES HD= 1.000@+02 RD=, 0.0@+00

ANGLE	NUMBER OF REFLECTIONS						
(COSINE)	0	1	2	3	4	5	6
0.9000	2.5489@-02	9.9308@-02	2.3679@-02	5.7730@-03	1.3259@-03	2.3701@-04	3.8490@-05
0.8000	3.4009@-02	9.9569@-02	2.3760@-02	6.0972@-03	1.1393@-03	2.7464@-04	6.5521@-05
0.7000	4.4796@-02	8.1264@-02	2.2703@-02	4.7031@-03	1.3619@-03	2.4490@-04	7.3484@-05
0.6000	3.7885@-02	9.9357@-02	2.0642@-02	5.1326@-03	1.1178@-03	3.5650@-05	6.7027@-05
0.5000	4.3321@-02	9.5231@-02	2.1548@-02	4.9843@-03	1.1296@-03	3.1724@-04	1.1658@-04
0.4000	5.3968@-02	7.7577@-02	2.0789@-02	5.4582@-03	1.0816@-03	2.7665@-04	7.2328@-05
0.3000	6.6336@-02	7.4174@-02	1.7099@-02	4.4201@-03	8.0338@-04	2.6885@-04	5.7432@-05
0.2000	7.6006@-02	7.3862@-02	1.5913@-02	2.8598@-03	7.6513@-04	1.6767@-04	4.3444@-05
0.1000	7.5037@-02	5.7401@-02	1.3375@-02	3.5779@-03	6.2564@-04	1.3775@-04	1.0986@-05
0.0000	1.2367@-01	3.6580@-02	8.5464@-03	2.0378@-03	1.7789@-04	1.1930@-04	2.4801@-05
-0.1000	1.1665@-01	4.2790@-02	1.3228@-02	1.7572@-03	8.3798@-04	1.3357@-04	9.1686@-06
-0.2000	7.1991@-02	3.0661@-02	6.1386@-03	2.2345@-03	6.1516@-04	1.2659@-05	3.1677@-05
-0.3000	4.2976@-02	1.3555@-02	5.4225@-03	7.0688@-04	2.4813@-04	2.9098@-05	2.0546@-06
-0.4000	3.7664@-02	8.7468@-03	4.7767@-03	5.7339@-04	1.9435@-04	1.5415@-05	1.3440@-06
-0.5000	3.5006@-02	1.0239@-02	2.0361@-03	5.4551@-04	1.4410@-04	3.1991@-05	6.3722@-06
-0.6000	2.5100@-02	9.3811@-03	2.4249@-03	5.1669@-04	9.7081@-05	2.4327@-05	2.5972@-06
-0.7000	2.0137@-02	7.6380@-03	1.9703@-03	4.3369@-04	8.9264@-05	1.0700@-05	3.4826@-07
-0.8000	2.0526@-02	8.6879@-03	1.9067@-03	5.0153@-04	4.7054@-05	1.2784@-05	4.7260@-06
-0.9000	2.0247@-02	6.0146@-03	1.8456@-03	3.0318@-04	7.1856@-05	1.9610@-05	4.0817@-06
-1.0000	1.4172@-02	7.1915@-03	1.8995@-03	1.7174@-04	6.3234@-05	3.2902@-06	1.6811@-06
TOTAL	9.8499@-01	9.3943@-01	2.2970@-01	5.2588@-02	1.1936@-02	2.6940@-03	6.3415@-04

RADIATION RESEARCH ASSOCIATES SLITE0 PROBLEM 1600

SCATTERED LIGHT INTENSITY VERSUS ANGLE AND NUMBER OF REFLECTIONS FROM SURFACE 1
SOURCE HEIGHT H= 3.0000+02. DETECTOR COORDINATES HD= 1.0000+02 RD=, 0.0+00

ANGLE (COSINE)	NUMBER OF REFLECTIONS 7	8	9	TOTAL
0.9000	1.1916@-05	3.1572@-06	0.0000@+00	1.5586@-01
0.8000	1.0008@-05	1.1068@-06	0.0000@+00	1.5493@-01
0.7000	1.5744@-05	4.6448@-07	0.0000@+00	1.5516@-01
0.6000	1.2864@-05	2.5548@-07	0.0000@+00	1.5457@-01
0.5000	2.8939@-06	2.6087@-06	0.0000@+00	1.5665@-01
0.4000	1.7601@-05	5.6522@-07	0.0000@+00	1.5944@-01
0.3000	1.6834@-05	3.4857@-07	0.0000@+00	1.5318@-01
0.2000	5.4681@-06	8.5398@-07	0.0000@+00	1.5922@-01
0.1000	6.5032@-06	3.5057@-07	0.0000@+00	1.5017@-01
0.0000	6.0120@-06	0.0000@+00	0.0000@+00	1.7116@-01
-0.1000	5.6375@-07	0.0000@+00	0.0000@+00	1.7541@-01
-0.2000	2.9844@-06	2.9461@-07	0.0000@+00	1.1169@-01
-0.3000	9.1186@-07	0.0000@+00	0.0000@+00	6.2943@-02
-0.4000	1.8524@-07	1.0730@-08	0.0000@+00	5.1972@-02
-0.5000	0.0000@+00	0.0000@+00	0.0000@+00	4.8010@-02
-0.6000	3.4378@-08	0.0000@+00	0.0000@+00	3.7547@-02
-0.7000	1.7691@-06	0.0000@+00	0.0000@+00	3.0481@-02
-0.8000	2.4513@-07	0.0000@+00	0.0000@+00	3.1687@-02
-0.9000	5.0606@-07	0.0000@+00	0.0000@+00	2.8506@-02
-1.0000	9.6094@-07	0.0000@+00	0.0000@+00	2.3504@-02
TOTAL	1.1401@-04	1.0036@-05	0.0000@+00	2.2221@+00

RADIATION RESEARCH ASSOCIATES GLITE PROBLEM 1600

SCATTERED LIGHT INTENSITY VERSUS ANGLE AND NUMBER OF REFLECTIONS FROM SURFACE 1
SOURCE HEIGHT H= 3.000E+02. DETECTOR COORDINATES HD= 2.000E+02 RD=, 0.0E+00

ANGLE	NUMBER OF REFLECTIONS						
(COSINE)	0	1	2	3	4	5	6
0.9000	3.0158E-02	9.3991E-02	2.2211E-02	5.4265E-03	1.2138E-03	2.1635E-04	3.9976E-05
0.8000	4.3519E-02	9.4442E-02	2.2207E-02	5.4600E-03	1.0624E-03	2.4725E-04	6.5987E-05
0.7000	5.6188E-02	7.7287E-02	2.1084E-02	4.5009E-03	1.2522E-03	2.2723E-04	6.6647E-05
0.6000	4.9471E-02	9.1246E-02	1.8979E-02	4.7886E-03	1.0069E-03	3.3365E-04	5.8562E-05
0.5000	5.6084E-02	8.5310E-02	1.9245E-02	4.4665E-03	9.9845E-04	2.7245E-04	1.0311E-04
0.4000	6.4016E-02	6.7602E-02	1.8412E-02	5.0492E-03	9.4111E-04	2.3269E-04	6.1129E-05
0.3000	7.7269E-02	6.4987E-02	1.4581E-02	4.1106E-03	7.4081E-04	2.4924E-04	4.6771E-05
0.2000	9.9226E-02	5.6684E-02	1.3893E-02	2.4944E-03	8.2040E-04	1.1690E-04	5.0441E-05
0.1000	1.0752E-01	4.6467E-02	1.0922E-02	3.1565E-03	3.8404E-04	1.8033E-04	1.3440E-05
0.0000	1.1529E-01	4.6092E-02	8.3306E-03	1.2394E-03	3.5840E-04	1.4199E-04	4.5907E-06
-0.1000	4.9396E-02	3.3309E-02	5.1437E-03	3.9355E-04	4.7463E-05	1.5515E-05	2.5871E-06
-0.2000	2.5266E-02	1.4288E-02	1.8522E-03	1.2143E-04	1.7073E-04	2.9493E-06	0.0000E+00
-0.3000	1.1692E-02	4.2511E-03	6.8961E-04	1.9132E-04	2.8195E-05	9.1915E-08	1.2091E-07
-0.4000	1.1161E-02	3.1468E-03	1.1300E-03	1.2551E-04	3.4219E-06	1.0280E-06	0.0000E+00
-0.5000	5.9926E-03	7.1007E-04	2.1758E-04	1.8480E-05	5.3954E-05	1.5151E-06	6.9766E-06
-0.6000	2.8784E-03	2.0515E-03	5.3456E-04	5.2066E-05	8.3845E-06	1.2004E-05	6.0927E-07
-0.7000	5.9985E-03	1.6543E-03	3.1249E-04	1.1629E-04	5.2154E-06	1.7139E-07	1.0621E-07
-0.8000	3.8844E-03	1.7964E-03	4.3389E-04	6.3535E-05	6.7539E-06	4.0848E-06	1.9688E-07
-0.9000	3.7302E-03	9.4376E-04	2.6867E-04	2.3181E-05	2.6831E-05	9.9307E-06	2.0223E-07
-1.0000	2.7787E-03	1.7624E-03	4.3732E-04	6.0204E-05	2.0797E-06	2.3803E-07	8.7870E-07
TOTAL	8.2152E-01	7.9202E-01	1.8088E-01	4.2462E-02	9.1314E-03	2.2656E-03	5.2233E-04

RADIATION RESEARCH ASSOCIATES BLITZ PROBLEM 1600

SCATTERED LIGHT INTENSITY VERSUS ANGLE AND NUMBER OF REFLECTIONS FROM SURFACE 1
SOURCE HEIGHT H= 3.000E+02. DETECTOR COORDINATES HD= 2.000E+02 RD=, 0.0E+00

ANGLE (COSINE)	NUMBER OF REFLECTIONS 7	8	9	TOTAL
0.9000	1.2144E-05	2.8343E-06	0.0000E+00	1.5327E-01
0.8000	9.2784E-06	9.8050E-07	0.0000E+00	1.6721E-01
0.7000	1.3831E-05	4.0290E-07	0.0000E+00	1.6062E-01
0.6000	1.0991E-05	6.5891E-07	0.0000E+00	1.6590E-01
0.5000	3.8477E-06	2.1697E-06	0.0000E+00	1.6669E-01
0.4000	1.8018E-05	4.5240E-07	0.0000E+00	1.5633E-01
0.3000	1.2846E-05	2.5010E-07	0.0000E+00	1.6200E-01
0.2000	4.9141E-06	6.0009E-07	0.0000E+00	1.7549E-01
0.1000	3.4158E-06	1.7588E-07	0.0000E+00	1.7064E-01
0.0000	1.2618E-06	0.0000E+00	0.0000E+00	1.7146E-01
-0.1000	1.3237E-08	0.0000E+00	0.0000E+00	8.8308E-02
-0.2000	0.0000E+00	5.3027E-07	0.0000E+00	4.1704E-02
-0.3000	0.0000E+00	0.0000E+00	0.0000E+00	1.6852E-02
-0.4000	2.5600E-07	0.0000E+00	0.0000E+00	1.5568E-02
-0.5000	0.0000E+00	0.0000E+00	0.0000E+00	7.0012E-03
-0.6000	4.1423E-08	0.0000E+00	0.0000E+00	5.5376E-03
-0.7000	7.6100E-07	0.0000E+00	0.0000E+00	6.0883E-03
-0.8000	1.1854E-07	0.0000E+00	0.0000E+00	5.1894E-03
-0.9000	3.6550E-09	0.0000E+00	0.0000E+00	5.0028E-03
-1.0000	0.0000E+00	0.0000E+00	0.0000E+00	5.0459E-03
TOTAL	9.1741E-05	9.0550E-06	0.0000E+00	1.8489E+00

RADIATION RESEARCH ASSOCIATES *LITE* PROBLEM 1600

SCATTERED LIGHT INTENSITY VERSUS ANGLE AND NUMBER OF REFLECTIONS FROM SURFACE 1
SOURCE HEIGHT H= 3.000*+02. DETECTOR COORDINATES HO= 2.990*+02 RO=, 0.0*+00

ANGLE (COSINE)	NUMBER OF REFLECTIONS 0	1	2	3	4	5	6
0.9000	3.0779*-02	9.2519*-02	2.1692*-02	5.3560*-03	1.1923*-03	2.1044*-04	3.9726*-05
0.8000	4.6212*-02	9.1895*-02	2.1639*-02	5.5529*-03	1.0302*-03	2.4114*-04	6.3940*-05
0.7000	6.2230*-02	7.6424*-02	2.0572*-02	4.3954*-03	1.2173*-03	2.2289*-04	6.4459*-05
0.6000	5.2976*-02	8.8387*-02	1.8509*-02	4.8486*-03	9.7464*-04	3.2125*-04	5.6344*-05
0.5000	6.0647*-02	8.3291*-02	1.8814*-02	4.4604*-03	9.5987*-04	2.6409*-04	9.8254*-05
0.4000	6.8516*-02	6.6400*-02	1.7781*-02	5.0264*-03	8.9379*-04	2.2104*-04	6.0908*-05
0.3000	8.4183*-02	6.2643*-02	1.4351*-02	4.0453*-03	7.0772*-04	2.3376*-04	5.0814*-05
0.2000	9.3668*-02	5.5438*-02	1.3182*-02	2.6405*-03	7.3483*-04	1.5601*-04	4.6231*-05
0.1000	1.0913*-01	4.4234*-02	1.1611*-02	3.0360*-03	6.7733*-04	1.8095*-04	1.1400*-05
0.0000	1.0593*-01	3.3454*-02	1.2428*-02	1.9852*-03	2.5106*-04	9.6766*-05	5.5874*-06
-0.1000	0.0000*+00	3.4579*-04	0.0000*+00	0.0000*+00	0.0000*+00	0.0000*+00	0.0000*+00
-0.2000	0.0000*+00	0.0000*+00	0.0000*+00	0.0000*+00	0.0000*+00	0.0000*+00	0.0000*+00
-0.3000	1.1651*-04	3.9256*-04	6.6737*-06	0.0000*+00	0.0000*+00	0.0000*+00	0.0000*+00
-0.4000	1.8355*-04	0.0000*+00	0.0000*+00	0.0000*+00	0.0000*+00	5.8682*-07	0.0000*+00
-0.5000	0.0000*+00	0.0000*+00	0.0000*+00	0.0000*+00	0.0000*+00	0.0000*+00	0.0000*+00
-0.6000	0.0000*+00	0.0000*+00	0.0000*+00	0.0000*+00	0.0000*+00	0.0000*+00	0.0000*+00
-0.7000	0.0000*+00	0.0000*+00	0.0000*+00	0.0000*+00	0.0000*+00	0.0000*+00	0.0000*+00
-0.8000	0.0000*+00	0.0000*+00	0.0000*+00	4.7132*-08	0.0000*+00	0.0000*+00	0.0000*+00
-0.9000	5.9922*-04	3.1691*-07	0.0000*+00	0.0000*+00	0.0000*+00	3.4884*-08	0.0000*+00
-1.0000	0.0000*+00	7.4685*-05	0.0000*+00	0.0000*+00	0.0000*+00	0.0000*+00	0.0000*+00
TOTAL	7.1518*-01	6.9550*-01	1.7059*-01	4.1147*-02	8.6390*-03	2.1490*-03	4.9766*-04

RADIATION RESEARCH ASSOCIATES ALIEN PROBLEM 1600

SCATTERED LIGHT INTENSITY VERSUS ANGLE AND NUMBER OF REFLECTIONS FROM SURFACE 1
SOURCE HEIGHT H= 3.000E+02. DETECTOR COORDINATES HD= 2.990E+02 RD=, 0.0E+00

ANGLE (COSINE)	NUMBER OF REFLECTIONS 7	8	9	TOTAL
0.9000	1.1807E-05	2.7559E-06	0.0000E+00	1.5180E-01
0.8000	8.9922E-06	9.5006E-07	0.0000E+00	1.6664E-01
0.7000	1.4761E-05	3.8827E-07	0.0000E+00	1.6514E-01
0.6000	1.0550E-05	6.6293E-07	0.0000E+00	1.6588E-01
0.5000	4.2182E-06	2.0681E-06	0.0000E+00	1.6854E-01
0.4000	1.7012E-05	4.2309E-07	0.0000E+00	1.5892E-01
0.3000	1.1935E-05	2.2941E-07	0.0000E+00	1.6623E-01
0.2000	4.4627E-06	5.4746E-07	0.0000E+00	1.6587E-01
0.1000	2.8025E-06	1.4700E-07	0.0000E+00	1.6889E-01
0.0000	8.5047E-07	0.0000E+00	0.0000E+00	1.5415E-01
-0.1000	0.0000E+00	0.0000E+00	0.0000E+00	3.4579E-04
-0.2000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.3000	0.0000E+00	0.0000E+00	0.0000E+00	5.1775E-04
-0.4000	0.0000E+00	0.0000E+00	0.0000E+00	1.8414E-04
-0.5000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.6000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.7000	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
-0.8000	0.0000E+00	0.0000E+00	0.0000E+00	4.7132E-08
-0.9000	0.0000E+00	0.0000E+00	0.0000E+00	5.9958E-04
-1.0000	0.0000E+00	0.0000E+00	0.0000E+00	7.4688E-05
TOTAL	8.7391E-05	8.1722E-06	0.0000E+00	1.6338E+00

RADIATION RESEARCH ASSOCIATES -LITE@ PROBLEM 1600

SCATTERED LIGHT INTENSITY VERSUS REGION OF SCATTER

REGION	DETECTOR			
	01	02	03	04
1	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
2	2.8905@+00	2.2221@+00	1.8489@+00	1.6338@+00
3	0.0000@+00	0.0000@+00	0.0000@+00	0.0000@+00
TOTAL	2.8905@+00	2.2221@+00	1.8489@+00	1.6338@+00

LIGHT SCATTERED FROM REFLECTION SURFACES TO EACH DETECTOR.

DETECTOR 1, REFLECTED FLUX = 1.661@+00

DETECTOR 2, REFLECTED FLUX = 6.262@-01

DETECTOR 3, REFLECTED FLUX = 5.228@-01

DETECTOR 4, REFLECTED FLUX = 4.995@-01

RADIATION RESEARCH ASSOCIATES -LITE- PROBLEM 1600

DIRECT BEAM LIGHT INTENSITIES

DETECTOR	DIRECT INTENSITY
1	6.1648@-01
2	1.9757@+00
3	8.7603@+00
4	8.9982@+04

V. PROGRAM DESCRIPTION

Each of the LITE codes are divided into several subroutines which are designated as procedures in the ALGOL language. The ALGOL programs are compiled each time they are loaded on the computer and no object decks are produced. The ALGOL language requires that any procedure called by another procedure must be loaded before the calling procedure. For this reason the procedures used in the LITE-I and LITE-II codes are listed in the following sections in reverse order with respect to the order they are actually used on the machine. The following is a listing of the procedures used in the LITE codes and a one sentence description of each procedure.

Procedures Used in the LITE-I and LITE-II Codes

Procedure	Purpose
MAIN	Reads in the input data
SRMAIN+	Controls the flow of the problem on the machine
SRCHECK	Checks input data
SRDBEAM	Calculates direct intensities
SRSCTANG	Calculates scattering and direction after collision
SRREFLCT	Calculates new direction after a reflection
SRINITIAL	Initializes parameters used in accumulating the scattered intensities
SRPATHL	Generates random path lengths between collisions
SRANGLE	Selects source angles from input distribution
SRAVRAGE	Calculates and prints average scattered intensities as a function of collision number and receiver position over each deviation group

Procedure	Purpose
SRANSWER	Calculates and prints the average scattered intensities as a function of receiver position, receiver angle, and order of reflection over all histories
SRDETECT+	Calculates scattered intensities at receiver points from each collision point
SRDIFSCA*	Calculates the probability of a photon scattering into a direction so as to be headed toward the receiver from each collision point and reflection surface
SRDSTBD	Calculates the distance along particles direction to boundary of region containing collision
SRSEARCH	Locates region containing the particles position coordinates for each collision
SRRANDA	Generates random numbers used in the sampling processes

* This procedure is used only in LITE-I
\+ These procedures are different for each code. All other procedures are the same in both codes

The ALGOL listing of LITE-I is given in Section 5.1 and the ALGOL listing of LITE-II is given in Section 5.2. Card numbers 1000 - 18000 of the ALGOL language version of both codes contain control cards for operation of the codes on the Burroughs B-5000 computer. Cards 19000 - 116000 of both codes contain lists of the subscripted real and integral variables that are common to all of the procedures included in the LITE codes. Cards 117000 through 129000 contain function subprograms furnished by the B-5000 monitor system

5.1 ALGOL LISTING FOR THE LITE-I CODE

```
BEGIN FILE OUT PRINT 1          (2,15)); INTEGER XRAZQ,VVUHU,FZOVC,LKNJA,OK
VQK,QRANI,LJLOU,QCPOV; INTEGER ARRAY ZIKLA,QNCCL[0:12]; FORMAT HHFRK("TIME
 ON  ",I4,X96,I2,X1,A3," 1965"),CHQUB("TIME OFF ",I4,X30,"PRCC. TIME =",
I10," SECS",X20,"I/O TIME =",I10," SECS"); DEFINE QLZAT=LJLOU+FZOVC QIV 2
16000; QCPOV+FZOVC HOO 216000/3600#; FILL ZIKLA[*]WITH 0,31,59,90,120,151,
181,212,243,273,304,334,366; FILL QNCCL[*]WITH 0,"JAN","FEQ","MAR","APR",
"MAY","JUN","JUL","AUG","SEP","OCT","NOV","DEC"; FZOVC+TIME(1); LKNJA+TIME
(2); OKVQK+TIME(3); VVUHU+TIME(0); QRANI+100×VVUHU.[30:6]+10×VVUHU.[36:6]+V
VUHU.[42:6]; XRAZQ+1; WHILE QRANI≥ZIKLA[XRAZQ]DO XRAZQ+XRAZQ+1; QRANI+QRANI
-ZIKLA[XRAZQ-1]; QLZAT; WRITE(PRINT[PAGE],HHFRK,100×LJLOU+QCPOV,QRANI,QNCC
L[XRAZQ]);
BEGIN
FILE    CARD  (2,10);          FILE IN DAT (2,10);
FILE OUT PUNCH 0(2,10);
FILE XXXXXX 2(2,15);
SWITCH FILE FILESW+XXXXXX;
LABEL  FINIS;
BOOLEAN ARRAY  SENSL[0:4], SENSW[0:6];
REAL ARRAY
     ABC[0:20],
     SVTFLUX[0:25,     0:10],
      SVFLUX[0:25,0:25,0:10],
      SVDIFCOS[0:50,0:10 ],
      SVPDCOS [0:50,0:10 ],
      SVPHANG [0:50,0:10 ],
      SVAFLUX [0:25,0:10 ],
      SVPDR   [0:37,0:5  ],
      SVRFANG [0:37,0:5  ],
      SVSAFLUX[0:25,0: 10],
      SVSQFLUX[0:25,0:10 ],
      SVFLUD  [0:50,0:10 ],
      SVRFLCOS[0:50,0:10 ],
```

```
      SVA      [0:10 ],                                                  33000
      SVCANG   [0:37 ],                                                  34000
      SVEMP    [0:50 ],                                                  35000
      SVFLUR   [0:10 ],                                                  36000
      SVCIPA   [0:25 ],                                                  37000
      SVFFLUX  [0:10 ],                                                  38000
      SVALREDO[0:5  ],                                                   39000
      SVCOEE   [0:50 ],                                                  40000
      SVDVFLUX[0:10 ],                                                   41000
      SVHD     [0:10 ],                                                  42000
      SVPAG    [0:37 ],                                                  43000
      SVRAYLEE[0:10 ],                                                   44000
      SVSANG   [0:500],                                                  45000
      SVSTFLUX[0:10 ],                                                   46000
      SVWEIGHT[0:500],                                                   47000
      SVDBFLUX[0:10 ],                                                   48000
      SVPHANG  [0:50 ],                                                  49000
      SVWAG    [0:37 ],                                                  50000
      SVPRFLT  [0:50 ],                                                  51000
      SVRD     [0:10 ],                                                  52000
      SVRFLUX  [0:10 ],                                                  53000
      SVSIGNDT[0:10 ],                                                   54000
      SVSUMRHO[0:50 ],                                                   55000
      SVCRATIO [0:10] ,                                                  56000
      SVHV[0:100],                                                       57000
      SVTAU[0:100],                                                      58000
SVSCATR[0:100],                                                          59000
      SVRAYR[0:100],                                                     60000
      SVTAUHD[0:10],                                                     61000
      SVOBSS   [0:10 ];                                                  62000
INTEGER ARRAY                                                            63000
      SVIB     [0:4 ,0:50 ],                                             64000
```

```
      SVMPR   [0:4 ,0:50 ],                                              65000
      SVJREFLT[0:5  ],                                                   66000
      SVNDFCOS[0:10 ],                                                   67000
      SVNREG  [0:50 ],                                                   68000
      SVINCOL [0:25 ],                                                   69000
      SVMAT   [0:50 ],                                                   70000
      SVNB    [0:50 ],                                                   71000
      SVNPHANG[0:10 ],                                                   72000
      SVNRFANG[0:5  ],                                                   73000
      SVNRICO [0:50 ],                                                   74000
      SVITYPE [0:50 ],                                                   75000
      SVMATERL[0:10 ],                                                   76000
      SVNBOUND[0:50 ],                                                   77000
      SVNPHID [0:10 ],                                                   78000
    NRFB[0:5],                                                           79000
      SVNRFCOS[0:5  ]                                                    80000
REAL                                                                     81000
    JALPHA ,   JBETA  ,   JBRAC  ,   JCDEPHI,   JCOTH  ,                82000
    JCOTH1 ,   JCOTH2 ,   JCPA   ,   JCPHI  ,   JCPHI1 ,                83000
    JCPHI2 ,   JCPHID ,   JCPRRD ,   JCPT   ,   JCSA   ,                84000
    JCSANG ,   JCTEP  ,   JDELTA ,   JDEOM  ,   JDIFH  ,                85000
    JDIST  ,   JDLONG ,   JDOM   ,   JDT    ,   JEAH   ,                86000
    JELIM  ,   JFI    ,   JFNPA  ,   JFNRA  ,   JH     ,                87000
    JH1    ,   JH2    ,   JHS    ,   JHT    ,                           88000
                                     JPAG   ,   JPJM1  ,                89000
    JPL    ,   JPSCAT ,   JR     ,   JR1    ,   JR2    ,                90000
    JREFL  ,   JRESULT,   JRHO   ,   JRHOT  ,   JRN    ,                91000
    JRRD2  ,   JRRDSQ ,   JRT    ,   JSDEPHI,   JSITH  ,                92000
    JSITH1 ,   JSITH2 ,   JSMVAL ,   JSOD   ,   JSPHI  ,                93000
    JSPHI1 ,   JSPHI2 ,   JSPHID ,   JSPT   ,   JSSANG ,                94000
    JSTEP  ,   JSUMDST,   JSUMSQ ,   JT     ,   JTEMP  ,                95000
    JTS    ,   JUPLMIT,   JWAIT  ,   JWCO   ,   JWHOA  ,                96000
```

```
  JRATLEE, JTAUH, JTAUH1, JTAUH2,                                    97000
    JX     ,    JXR    ,    JERRORS,    JDMIN  ;                    98000
INTEGER                                                              99000
      JJHB, JJHT, JNREFL, JMAXR, JNMAXR, JIBAS1, JIBAS2,             100000
      JIBAS3, JIBAS4, JIBAS5, JNOH,                                  101000
                                                  JIBASE ,           102000
    JICB   ,    JIDUMP ,    JJ1    ,    JKA1   ,    JKA2   ,       103000
    JKA3   ,    JKA4   ,    JLA    ,    JLB    ,    JLIBRAY,       104000
    JLOC   ,    JLP    ,    JLSR   ,    JLST   ,    JMAT1  ,       105000
    JMAT2  ,    JMAXCOL,    JMPREG ,    JNAG   ,    JNAGP  ,       106000
    JNAOP  ,    JNAOPP ,    JNBMAX ,    JNBMAXP,    JNCB   ,       107000
    JNCM   ,    JNCMAX ,    JNCOL  ,    JNCR   ,    JNCR1  ,       108000
    JNCR2  ,    JNCYC  ,    JNDEVG ,    JNDMAX ,    JNDMAXP,       109000
    JNFORM ,    JNGROUP,    JNHIST ,    JNHMAX ,    JNLB   ,       110000
    JNLM   ,    JNMAT  ,    JNMATP ,    JNOGO  ,    JNPA   ,       111000
    JNPAP  ,    JNPART ,    JNPHASE,    JNPCOL ,    JNPCOLP,       112000
    JNPROB ,    JNRA   ,    JNRFLB ,    JNRFLBP,    JNRING ,       113000
    JNRMAX ,    JNRMAXP,    JNRSTOP,    JNSOREG,    JNSY   ,       114000
    JNSP   ,    JNUB   ,    JNWAIT ,    K,  JNRB ;                 115000
REAL  Q,XPR;                                                         116000
FORMAT F(//////"STOP / PAUSE  NO. ",I5);                             117000
REAL PROCEDURE INT(ARG1);          VALUE ARG1;       REAL ARG1;      118000
   INT←SIGN(ARG1)×ENTIER(ABS(ARG1));                                 119000
REAL PROCEDURE TANH(ARG1);         VALUE ARG1;       REAL ARG1;      120000
   TANH←((Q←EXP(ARG1×2))-1)/(Q+1);                                   121000
REAL PROCEDURE MAX(ARG1,ARG2);     VALUE ARG1,ARG2;  REAL ARG1,ARG2; 122000
   MAX←IF ARG1≥ARG2 THEN ARG1 ELSE ARG2;                             123000
REAL PROCEDURE MIN(ARG1,ARG2);     VALUE ARG1,ARG2;  REAL ARG1,ARG2; 124000
   MIN←IF ARG1≤ARG2 THEN ARG1 ELSE ARG2;                             125000
REAL PROCEDURE DIM(ARG1,ARG2);     VALUE ARG1,ARG2;  REAL ARG1,ARG2; 126000
   DIM←MAX(ARG1-ARG2,0);                                             127000
PROCEDURE ERROR(ARG1);             VALUE ARG1;       REAL ARG1;      128000
```

```
BEGIN WRITE(PRINT,F,ARG1)$ GO TO FINIS END$                                    129000
PROCEDURE SRRANDA(JIBASE,JRN)$                                                 130000
INTEGER JIBASE$                                                                131000
REAL JRN$                                                                      132000
BEGIN INTEGER A, B$                                                            133000
      A.[12:18] ← JIBASE.[30:18]$                                              134000
      B.[12:35] ← JIBASE.[13:35]$                                              135000
      JIBASE.[12:36] ← A+B+JIBASE$                                             136000
      A ← +0$                                                                  137000
      A.[21:27] ← JIBASE.[12:27]$                                              138000
      JRN ← A$                                                                 139000
      JRN ← JRN/134217728.0$                                                   140000
END SRRANDA$                                                                   141000
PROCEDURE SRSEARCH$                                                            142000
BEGIN                                                                          143000
INTEGER   JI,JJ,JK$                                                            144000
FORMAT FL23(/" BOUNDARY",I3," HAS BEEN INCORRECTLY IDENTIFIED."),              145000
FL37(/" POINT LIES ON BOUNDARY",I3),                                           146000
FL85(/" SEARCH CYCLE THROUGH REGIONS IS NOT HANDELED PROPERLY."),              147000
FL95(/" CANNOT FIND REGION FOR POINT WITH COORDINATES R = ",E10.3,             148000
   ", H = ",E10.3)$                                                            149000
LIST LIST1(JNCB)$                                                              150000
LIST LIST2(JH,JR)$                                                             151000
LABEL L5,L10,L20,L25,L30,L35,L38,L40,L50,L60,L80,L90,L97,L100,L36,L37$          152000
L5: JNSY←0$                                                                    153000
JNLB←JMPREG$                                                                   154000
JNUB←JNRMAX$                                                                   155000
L10: JK←JNLB$                                                                  156000
DO BEGIN                                                                       157000
  JJ←SVNB[JK]$                                                                 158000
  JI←1$                                                                        159000
  DO BEGIN                                                                     160000
```

```
    JNCB←ABS(SVIB[JI,JK]);                                          161000
    IF (XPR←(SVITYPE[JNCB]-1))>0 THEN GO TO L30;                    162000
    IF XPR=0 THEN GO TO L25;                                        163000
    L20: WRITE(PRINT,FL23,LIST1);                                   164000
    JWHOA←JWHOA+1;                                                  165000
    GO TO L50;                                                      166000
    L25: JXR←SVCOEE[JNCB]-JH;                                       167000
    GO TO L35;                                                      168000
    L30: JXR←SVCOEE[JNCB]-JR;                                       169000
    L35: IF (XPR←(JXR))>0 THEN GO TO L40;                           170000
    IF XPR<0 THEN GO TO L38;                                        171000
    WRITE(PRINT,FL37,LIST1);                                        172000
    IF JCOTH > 0 THEN GO TO L36 ;                                   173000
JH ← JH - JDELTA ;                                                  174000
GO TO L37 ;                                                         175000
L36:                                                                176000
JH ← JH + JDELTA ;                                                  177000
L37:                                                                178000
    JR←JR+JDELTA×JSITH×JCPHI;                                       179000
    GO TO L5;                                                       180000
    L38: IF (XPR←(SVIB[JI,JK]))>0 THEN GO TO L60;                   181000
    IF XPR=0 THEN GO TO L20 ELSE GO TO L50;                         182000
    L40: IF (XPR←(SVIB[JI,JK]))=0 THEN GO TO L20;                   183000
    IF XPR<0 THEN GO TO L60;                                        184000
    L50: END UNTIL (JI←(JI+1))>JJ;                                  185000
  JNCR←JK;                                                          186000
  GO TO L100;                                                       187000
  L60: END UNTIL (JK←(JK+1))>JNUB;                                  188000
IF (XPR←(JNSY))>0 THEN GO TO L90;                                   189000
IF XPR<0 THEN GO TO L80;                                            190000
JNSY←1;                                                             191000
JNLB←1;                                                             192000
```

```
JNUB←JMPREG;                                                          193000
GO TO L10;                                                            194000
L80: WRITE(PRINT,FL85);                                               195000
JWHOA←JWHOA+1;                                                        196000
GO TO L97;                                                            197000
L90: WRITE(PRINT,FL95,LIST2);                                         198000
JWHOA←JWHOA+1;                                                        199000
L97: JNCR←0;                                                          200000
L100:  END;                                                           201000
PROCEDURE SRDSTBD;                                                    202000
BEGIN                                                                 203000
INTEGER      JJ,JK;                                                   204000
COMMENT  THE FOLLOWING SUBROUTINES ARE REQUIRED:                      205000
    SRSEARCH;                                                         206000
FORMAT FL15(" BOUNDARY",I3," HAS BEEN IDENTIFIED INCORRECTLY."),      207000
FL55(/" LOC =",I4,"  ICB =",I4,"  X =",E10.3,"  BRAC =",E10.3,        208000
   "  DIST =",E10.3/" H =",E10.3,"  R =",E10.3,"  COEE(ICB) =",E10.3,  209000
   "  ITYPE(ICB) =",I4),                                              210000
FL75(/" COLLISION POINT IS WITHIN A DISTANCE OF 1.1 DELTA FROM BOUNDAR",211000
"Y",I4,".  IT WAS MOVED OFF THE BOUNDARY.");                          212000
LIST LIST1(JICB);                                                     213000
LIST LIST2(JLOC,JICB,JX,JBRAC,JDIST,JH,JR,SVCOEE[JICB],SVITYPE[       214000
 JICB]);                                                              215000
LIST LIST3(JNCB);                                                     216000
LABEL L5,L20,L30,L36,L38,L39,L56,L60,L80;                             217000
JNCB←0;                                                               218000
JJ1←1;                                                                219000
JLOC←105;                                                             220000
L5: JDIST←JDLONG;                                                     221000
JK←SVNB[JNCR];                                                        222000
JJ←1;                                                                 223000
DO BEGIN                                                              224000
```

```
  JICB←ABS(SVIB[JJ,JNCR])⍝                                          225000
  IF (XPR←(SVITYPE[JICB]-1))>0 THEN GO TO L30⍝                      226000
  IF XPR=0 THEN GO TO L20⍝                                          227000
  WRITE(PRINT,FL15,LIST1)⍝                                          228000
  JWHOA←JWHOA+1⍝                                                    229000
  GO TO L60⍝                                                        230000
  L20: IF (ABS(JCOTH)≤JSMVAL) THEN GO TO L60⍝                       231000
  JX←(SVCOEE[JICB]-JH)/JCOTH⍝                                       232000
  GO TO L39⍝                                                        233000
  L30: IF (ABS(JSITH)≤JSMVAL) THEN GO TO L60⍝                       234000
  JBRAC←(SVCOEE[JICB]*2-(JR×JSPHI)*2)⍝                              235000
  IF JBRAC≤0 THEN GO TO L60⍝                                        236000
  IF (XPR←(SVCOEE[JICB]-JR))>0 THEN GO TO L38⍝                      237000
  IF XPR<0 THEN GO TO L36⍝                                          238000
  JMPREG←JNCR⍝                                                      239000
  SRSEARCH⍝                                                         240000
  IF (JERRORS≥JWHOA) THEN GO TO L5 FLSE GO TO L60⍝                  241000
  L36: JX←(-JR×JCPHI-SQRT(JBRAC))/JSITH⍝                            242000
  GO TO L39⍝                                                        243000
  L38: JX←(-JR×JCPHI+SQRT(JBRAC))/JSITH⍝                            244000
  L39: IF JIDUMP≤0 THEN GO TO L56⍝                                  245000
  WRITE(PRINT,FL55,LIST2)⍝                                          246000
  L56: IF JX≤0 THEN GO TO L60⍝                                      247000
  IF (JDIST≤JX) THEN GO TO L60⍝                                     248000
  JDIST←JX+JDELTA⍝                                                  249000
  JNCB←JICB⍝                                                        250000
  JJ1←JJ⍝                                                           251000
  L60: END UNTIL (JJ←(JJ+1))>JK⍝                                    252000
IF (JDIST≥1.1×JDELTA) THEN GO TO L80⍝                               253000
WRITE(PRINT,FL75,LIST3)⍝                                            254000
JH←JH+JDELTA×JCOTH⍝                                                 255000
JR←JR+JDELTA×JSITH×JCPHI⍝                                           256000
```

```
JMPREG←SVMPR[JJ1,JNCR];                                                 257000
SRSEARCH;                                                               258000
IF JNCR>0 THEN GO TO L5;                                                259000
L80:  END;                                                              260000
PROCEDURE SRDIFSCA;                                                     261000
BEGIN                                                                   262000
INTEGER       JI,JJAIL;                                                 263000
COMMENT  THE FOLLOW'NG SUBROUTINES ARE REQUIRED:                        264000
    SRRANDA;                                                            265000
FORMAT FL55(/                                                           266000
   " THE COSINE VALUES FOR WHICH THE MIE SCATTERING PHASE FUNCTION ",   267000
   "ARE INPUT ARE INCORRECT FOR MATERIAL",I3,".");                      268000
LIST L'ST1(JNCM);                                                       269000
LABEL L110,L150,L170,L5,L20,L52,L60,L80;                                270000
SWITCH SWG01←L110,L150,L110,L150;                                       271000
IF JREFL≤0 THEN GO TO L5;                                               272000
JJAIL←SVJREFLT[JNRB];                                                   273000
GO TO SWG01[JJAIL];                                                     274000
L110: JPSCAT←1/6.28318;                                                 275000
GO TO L80;                                                              276000
L150: JNCYC←SVNRFANG[JNRB];                                             277000
JI←1;                                                                   278000
DO BEGIN                                                                279000
  IF (JCSA≥SVRFANG[JI,JNRB]) THEN GO TO L170;                           280000
  END UNTIL (JI←(JI+1))>JNCYC;                                          281000
L170: JPSCAT←SVPOR[JI-1,JNRB]+(SVPOR[JI,JNRB]-SVPOR[JI-1,JNRB])×(JCSA-  282000
 SVRFANG[JI-1,JNRB])/(SVRFANG[JI,JNRB]-SVRFANG[JI-1,JNRB]);             283000
GO TO L80;                                                              284000
L5: SRRANDA(JIBASE,JRN);                                                285000
IF (JRN>JRATLEE) THEN GO TO L20;                                        286000
JPSCAT←(1+JCSA×JCSA)×.059683;                                           287000
GO TO L80;                                                              288000
```

```
L20: JNCYC←SVNDFCOS[JNCM];                                              289000
JI←1;                                                                   290000
DO BEGIN                                                                291000
  IF (JCSA≥SVDIFCOS[JI,JNCM]) THEN GO TO L40;                           292000
  END UNTIL (JI←(JI+1))>JNCYC;                                          293000
L52: WRITE(PRINT,FL55,LIST1);                                           294000
JWHOA←JWHOA+1;                                                          295000
GO TO L80;                                                              296000
L40: IF (JI≤1) THEN GO TO L52;                                          297000
JPSCAT←SVPDCOS[JI-1,JNCM]+(SVPDCOS[JI,JNCM]-SVPDCOS[JI-1,JNCM])×(JCSA-  298000
 SVDIFCOS[JI-1,JNCM])/(SVDIFCOS[JI,JNCM]-SVDIFCOS[JI-1,JNCM]);          299000
L80:  END;                                                              300000
PROCEDURE SRDETECT;                                                     301000
BEGIN                                                                   302000
REAL    JCOD, JSID; INTEGER  JJ,JK,JL,JM, JLC;                          303000
COMMENT  THE FOLLOWING SUBROUTINES ARE REQUIRED:                        304000
    SRRANDA, SRDSTBD, SRSEARCH, SRDIFSCA;                               305000
FORMAT FL22(/" LOC =",I4," ALPHA =",E10.3," BETA =",E10.3," DIFH =",    306000
   E10.3/" RRD2 =",E10.3," RRDSQ =",E10.3," SUMSQ =",E10.3," SOD =",    307000
   E10.3/" NRING =",I4," J =",I4," K =",I4," CPT =",E10.3," SPT =",     308000
   E10.3/" DOM =",E10.3," CPHID =",E10.3," SPHID =",E10.3," CPRRD =",   309000
E10.3/" T =",E10.3," COTH =",E10.3," TEMP =",E10.3," SITH =",E10.3/     310000
   " CPHI =",E10.3," SPHI =",E10.3," H =",E10.3," R =",E10.3/           311000
   " RHOT =",E10.3," SUMDST =",E10.3," HT =",E10.3," DT =",F10.3/       312000
   " RN =",E10.3),                                                      313000
FL27(/" LOC =",I4," LSR =",I4," NCR =",I4," MAT1 =",I4," MAT2 =",I4,    314000
"  H =",E10.3/" TS =",E10.3," RT =",E10.3," CPHI =",E10.3," R =",       315000
   E10.3/" HT =",E10.3," DT =",E10.3," RHOT =",E10.3),                  316000
FL257(/" LOC =",I4," J =",I4," LA =",I4," LP =",I4," CSA =",E10.3,      317000
   "  PSCAT =",E10.3/" WAIT =",E10.3," RHOT =",E10.3," NRING =",I4,     318000
   "  CPA =",E10.3/" RESULT =",F10.3," FLUX(J,LP,LA) =",E10.3,          319000
   "  FLUD(J,NCR1) =",E10.3/" NCR1 =",I4," RFLUX(J) =",E10.3,           320000
```

```
   "  REFL ="",E10.3)};                                                    321000
LIST LIST1(JLOC,JALPHA,JBETA,JDIFH,JRRD2,JRRDSQ,JSUMSQ,JSOD,JNRING,JJ,    322000
 JK,JCPT,JSPT,JDOM,JCPHID,JSPHID,JCPRRD,JT,JCOTH,JTEMP,JSITH,JCPHI,       323000
 JSPHI,JH,JR,JRHOT,JSUMDST,JHT,JDT,JRN);                                  324000
LIST LIST2(JLOC,JLSR,JNCR,JMAT1,JMAT2,JH,JTS,JRT,JCPHI,JR,JHT,JDT,JRHOT) 325000
 ;                                                                         326000
LIST LIST3(JLOC,JJ,JLA,JLP,JCSA,JPSCAT,JWAIT,JRHOT,JNRING,JCPA,JRESULT,   327000
 SVFLUX[JLA,JLP,JJ],SVFLUD[JNCR1,JJ],JNCR1,SVRFLUX[JJ],JREFL);            328000
BEGIN                                                                      329000
  LABEL L10, L25, L100, L210, L230,                                        330000
 L250,L255,L260,L280,L300;                                                 331000
JALPHA←JSITH2×JCPHI2;                                                      332000
JBETA←JSITH2×JSPHI2;                                                       333000
JJ←1;                                                                      334000
DO BEGIN                                                                   335000
  JDIFH←SVHD[JJ]-JH2;                                                      336000
  JRRD2←JR2×SVRD[JJ]×2;                                                    337000
  JRRDSQ←SVRD[JJ]×SVRD[JJ]←JR2×JR2;                                        338000
  JSUMSQ←JRRDSQ←JDIFH↑2;                                                   339000
  JSOD←SQRT(SVRD[JJ]↑2←(SVHD[JJ]-JHS)↑2);                                  340000
  JCOD←(SVHD[JJ]-JHS)/JSOD;                                                341000
  JSID←SVRD[JJ]/JSOD;                                                      342000
  JNRING←SVNPHID[JJ];                                                      343000
  JK←1;                                                                    344000
  DO BEGIN                                                                 345000
    L10: SRRANDA(JIBAS1,JRN);                                              346000
    JCPT←2×JRN-1;                                                          347000
    SRRANDA(JIBAS2,JRN);                                                   348000
    JSPT←2×JRN-1;                                                          349000
    JDOM←JCPT↑2←JSPT↑2;                                                    350000
    IF (JDOM>1) THEN GO TO L10;                                            351000
    JDOM←SQRT(JDOM);                                                       352000
```

```
JCPHID←JCPT/JDOM;                                                    353000
JSPHID←JSPT/JDOM;                                                    354000
JCPRRD←JCPHID×JRRD2;                                                 355000
JT←SQRT(JSUMSQ-JCPRRD);                                              356000
IF (JT<JDMIN) THEN GO TO L260;                                       357000
JCOTH←JDIFH/JT;                                                      358000
JTEMP←SQRT(JRRDSQ-JCPRRD);                                           359000
JSITH←JTEMP/JT;                                                      360000
JLOC←90;                                                             361000
IF JIDUMP≤0 THEN GO TO L25;                                          362000
WRITE(PRINT,FL22,LIST1);                                             363000
  L25: IF(ABS(JCOTH)>JSMVAL) THEN GO TO L100;                        364000
  JRHOT←JT×(SVTAU[JJHT]-SVTAU[JJHB])/(SVHV[JJHT]-SVHV[JJHB]);        365000
  GO TO L210;                                                        366000
  L100: JRHOT ← (SVTAUHD[JJ]-JTAUH2)/JCOTH;                          367000
L210: JCSA←(JALPHA×(SVRD[JJ]×JCPHID-JR2)+JBETA×(SVRD[JJ]×JSPHID)+    368000
 JCOTH2×JDIFH)/JT;                                                   369000
SRDIFSCA;                                                            370000
IF (JERRORS<JWHOA) THEN GO TO L300;                                  371000
JRESULT←(JWAIT×JPSCAT×EXP(-JRHOT))/((JNRING)×JT↑2);                  372000
JCPA← (JSID×(SVRD[JJ] -JR2×JCPHID)/JT)+(JCOTH×JCOD);                 373000
JL←1;                                                                374000
DO BEGIN                                                             375000
  IF (SVCIPA[JL]≤JCPA) THEN GO TO L230;                              376000
  END UNTIL (JL←(JL+1))>JNPA;                                        377000
L230: JLA←JL;                                                        378000
  JLP ← JNREFL;                                                      379000
SVFLUX[JLA,JLP,JJ]←SVFLUX[JLA,JLP,JJ]+JRESULT;                       380000
SVFLUD[JNCR2,JJ]←SVFLUD[JNCR2,JJ]+JRESULT;                           381000
IF JREFL≤0 THEN GO TO L255;                                          382000
SVRFLUX[JJ]←SVRFLUX[JJ]+JRESULT;                                     383000
L255: JLOC←110;                                                      384000
```

```
    JM+1;                                                              385000
    DO BEGIN                                                           386000
      IF (SVINCOL[JM]≥JNCOL) THEN GO TO L250;                          387000
      END UNTIL (JM+(JM+1))>JNPCOL;                                    388000
    L250: JLC+JM;                                                      389000
      SVAFLUX[JLC,JJ] + SVAFLUX[JLC,JJ]+JRESULT;                       390000
    IF JIDUMP≤0 THEN GO TO L260;                                       391000
    WRITE(PRINT,FL257,LIST3);                                          392000
    L260: END UNTIL (JK+(JK+1))>JNRING;                                393000
  END UNTIL (JJ+(JJ+1))>JNDMAX;                                        394000
GO TO L300;                                                            395000
L280: JWHOA+JWHOA+1;                                                   396000
L300:  END END;                                                        397000
PROCEDURE SRANSWER;                                                    398000
BEGIN                                                                  399000
   REAL ARRAY SVIIREF[0:25];                                           400000
REAL  JFGROUP,JFNHMAX;      INTEGER  JI,JJ,JK,JN,JM ;                  401000
INTEGER  OX1;                                                          402000
FORMAT FL110(" RADIATION RESEARCH ASSOCIATES @LITE@ PROBLEM",I10),     403000
FL120(/" HISTORY TERMINATION COUNTERS."),                              404000
FL130(/" ",I9,                                                         405000
   " HISTORIES WERE TERMINATED WHEN THE COLLISION NUMBER EXCEEDED",I6, 406000
   "."/I10,                                                            407000
   " HISTORIES WERE TERMINATED BY THE REGION IMPORTANCE PARAMETERS."/  408000
   I10," HISTORIES WERE TERMINATED BY MINIMUM WEIGHT CUTOFF." /I10,    409000
 " HISTORIES WERE TERMINATED AFTER MAXIMUM NUMBER OF REFLECTIONS. "),  410000
    FL135 (/" ",I9,                                                    411000
       " COLLISIONS OCCURRED."),                                       412000
FL150(/                                                                413000
   " PARTICLES TERMINATED IN EACH REGION BY REGION IMPORTANCE PARAM",   414000
   "ETERS."),                                                          415000
FL160(/                                                                416000
```

```
   " REGION HISTORIES   REGION HISTORIES   REGION HISTORIES   REGIO",     417000
   "N HISTORIES"/                                                       418000
   "        TERMINATED          TERMINATED          TERMINATED       ",  419000
   "  TERMINATED"),                                                     420000
FL170(" ",I4,I9,I10,I9,I10,I9,I10,I9),                                  421000
FL190(/                                                                 422000
   "   SCATTERED LIGHT INTENSITY VERSUS ANGLE AND NUMBER OF ",          423000
   "REFLECTIONS FROM SURFACE 1"),                                       424000
FL200("       SOURCE HEIGHT H=",E10.3,".   DETECTOR COORDINATES  HD=",  425000
   E10.3,"  RD=,",E10.1,01),                                           426000
FL210("  ANGLE",X27,"NUMBER OF REFLECTIONS"),                           427000
FL250(" (COSINE)",I8,6(X9,I2)),                                         428000
FL262(" (COSINE)    TOTAL"),                                            429000
FL264(" ",X23,"TOTAL"),                                                 430000
FL266(" ",X34,"TOTAL"),                                                 431000
FL268(" ",X45,"TOTAL"),                                                 432000
FL270(" ",X56,"TOTAL"),                                                 433000
FL272(" ",X67,"TOTAL"),                                                 434000
FL274(" ",X78,"TOTAL"),                                                 435000
FL280(" ",R7.4,X1,7E11.4),                                              436000
FL300(/"  TOTAL  ",7E11.4),                                             437000
FL450(/                                                                 438000
   "                    SCATTERED LIGHT INTENSITY VERSUS REGION OF ",   439000
   "SCATTER"),                                                          440000
FL460(/"  REGION   ",X30,"DETECTOR"),                                   441000
FL485(/"                 01"),                                          442000
FL495(/"                 01          02"),                              443000
FL505(/"                 01          02          03"),                  444000
FL515(/"                 01          02          03          04"),      445000
FL525(/"                 01          02          03          04          05"),  446000
FL535(/                                                                 447000
   "                01          02          03          04          05  ",  448000
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   "       06"),                                                          449000
FL545(/                                                                   450000
   "               01          02          03          04          05  ",  451000
   "       06          07"),                                              452000
FL560("    ",I2,X3,7E11.4),                                               453000
FL580(/"  TOTAL  ",7E11.4),                                               454000
FL605(/"                08"),                                             455000
FL615(/"                08          09"),                                 456000
FL625(/"                08          09          10"),                     457000
FL680(" LIGHT SCATTERED FROM REFLECTION SURFACES TO EACH DETECTOR."),     458000
FL690(/" DETECTOR",I3,", REFLECTED FLUX =",E10.3)$                        459000
LIST LIST1(JNPROB)$                                                       460000
    LIST LIST14 (JNOGO)$                                                  461000
LIST LIST2(JMAXCOL,JNCMAX,JNRSTOP,JNWAIT,JNMAXR)$                         462000
LIST LIST3(FOR DX1=1 STEP 1 UNTIL JNRMAX DO (DX1,SVNRICO[DX1]))$          463000
LIST LIST4(JHS,SVHD[JJ],SVRO[JJ])$                                        464000
LIST LIST5(FOR DX1=JKA1 STEP 1 UNTIL JKA2 DO SVIIREF[DX1])$               465000
LIST LIST6(SVCIPA[JN],FOR DX1=JKA1 STEP 1 UNTIL JKA2 DO  SVFLUX[          466000
 JN,DX1,JJ])$                                                             467000
LIST LIST7(FOR DX1=JKA1 STEP 1 UNTIL JKA2 DO  SVTFLUX[DX1,JJ])$           468000
LIST LIST9(SVNREG[JI],FOR DX1=1 STEP 1 UNTIL JNFORM DO SVFLUD[JI,         469000
 DX1])$                                                                   470000
LIST LIST10(FOR DX1=1 STEP 1 UNTIL JNFORM DO SVFLUR[DX1])$                471000
LIST LIST11(SVNREG[JI],FOR DX1=8 STEP 1 UNTIL JNFORM DO SVFLUD[           472000
 JI,DX1])$                                                                473000
LIST LIST12(FOR DX1=8 STEP 1 UNTIL JNFORM DO SVFLUR[DX1])$                474000
LIST LIST13(JI,SVRFLUX[JI])$                                              475000
BEGIN                                                                     476000
LABEL L180,L185,L240,L261,L263,L265,L267,L269,L271,L273,L275,L430,        477000
 L440,L480,L490,L500,L510,L520,L530,L540,L550,L600,L610,L620,L650,        478000
 L670$                                                                    479000
SWITCH SWGO1=L261,L263,L265,L267,L269,L271,L273,L275$                     480000
```

```
SWITCH SWGD2←L480,L490,L500,L510,L520,L530,L540,L600,L610,L620;          481000
JFNHMAX←JNHMAX;                                                          482000
JFGROUP←JNGROUP;                                                         483000
JJ←1;                                                                    484000
DO BEGIN                                                                 485000
  JLST←JMAXR+1;                                                          486000
  JI←1;                                                                  487000
  DO BEGIN                                                               488000
    JK←1;                                                                489000
    DO BEGIN                                                             490000
       SVFLUX[JK,JI,JJ]← SVFLUX[JK,JI,JJ]/JFNHMAX;                       491000
       SVFLUX[JK,JLST,JJ]← SVFLUX[JK,JLST,JJ]+ SVFLUX[JK,JI,JJ];         492000
   SVTFLUX[JI,JJ]←SVTFLUX[JI,JJ]+SVFLUX[JK,JI,JJ];                       493000
      END UNTIL (JK←(JK+1))>JNPA;                                        494000
   SVTFLUX[JLST,JJ]←SVTFLUX[JLST,JJ]+SVTFLUX[JI,JJ];                     495000
  SVIIREF[JI]←JI-1;                                                      496000
    END UNTIL (JI←(JI+1))>JMAXR;                                         497000
  JM←1;                                                                  498000
  DO BEGIN                                                               499000
    SVFLUD[JM,JJ]←SVFLUD[JM,JJ]/JFNHMAX;                                500000
    SVFLUR[JJ]←SVFLUR[JJ]+SVFLUD[JM,JJ];                                 501000
    END UNTIL (JM←(JM+1))>JNRMAX;                                        502000
  SVRFLUX[JJ]←SVRFLUX[JJ]/JFNHMAX;                                       503000
  END UNTIL (JJ←(JJ+1))>JNDMAX;                                          504000
COMMENT  SUBROUTINE RESULT;                                              505000
WRITE(PRINT[PAGE]);                                                      506000
WRITE(PRINT,FL110,LIST1);                                                507000
WRITE(PRINT,FL120);                                                      508000
WRITE(PRINT,FL130,LIST2);                                                509000
    WRITE (PRINT,FL135,LIST14);                                          510000
IF JNRSTOP≤0 THEN GO TO L180;                                            511000
WRITE(PRINT,FL150);                                                      512000
```

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WRITE(PRINT,FL160);                                                    513000
WRITE(PRINT,FL170,LIST3);                                              514000
L180: JJ+1;                                                            515000
DO BEGIN                                                               516000
  JKA2+0;                                                              517000
  JKA3+0;                                                              518000
  L185: WRITE(PRINT[PAGE]);                                            519000
        WRITE(PRINT,FL110,LIST1);                                      520000
  WRITE(PRINT,FL190);                                                  521000
  WRITE(PRINT,FL200,LIST4);                                            522000
  WRITE(PRINT,FL210);                                                  523000
  JKA1+JKA2+1;                                                         524000
  JKA2+JKA1+6;                                                         525000
  IF (JKA2≤JMAXR) THEN GO TO L240;                                     526000
  JKA3+1;                                                              527000
  JKA2+JMAXR;                                                          528000
  IF (JKA1>JMAXR) THEN GO TO L261;                                     529000
  L240: WRITE(PRINT,FL250,LIST5);                                      530000
  IF JKA3≤0 THEN GO TO L275;                                           531000
  JKA2+JKA2+1;                                                         532000
  JKA4+JKA2-JKA1+1;                                                    533000
  GO TO SWGO1[JKA4];                                                   534000
  L261: WRITE(PRINT,FL262);                                            535000
  GO TO L275;                                                          536000
  L263: WRITE(PRINT,FL264);                                            537000
  GO TO L275;                                                          538000
  L265: WRITE(PRINT,FL266);                                            539000
  GO TO L275;                                                          540000
  L267: WRITE(PRINT,FL268);                                            541000
  GO TO L275;                                                          542000
  L269: WRITE(PRINT,FL270);                                            543000
  GO TO L275;                                                          544000
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  L271: WRITE(PRINT,FL272);                                          545000
  GO TO L275;                                                        546000
  L273: WRITE(PRINT,FL274);                                          547000
  L275: JN←1;                                                        548000
  DO BEGIN                                                           549000
    WRITE(PRINT,FL280,LIST6);                                        550000
    END UNTIL (JN←(JN+1))>JNPA;                                      551000
  WRITE(PRINT,FL300,LIST7);                                          552000
  IF JKA3≤0 THEN GO TO L185;                                         553000
  END UNTIL (JJ←(JJ+1))>JNDMAX;                                      554000
IF (JNDMAX>7) THEN GO TO L430;                                       555000
JNFORM←JNDMAX;                                                       556000
GO TO L440;                                                          557000
L430: JNFORM←7;                                                      558000
L440: WRITE(PRINT[PAGE]);                                            559000
      WRITE(PRINT,FL110,LIST1);                                      560000
WRITE(PRINT,FL450);                                                  561000
WRITE(PRINT,FL460);                                                  562000
GO TO SWGO2[JNFORM];                                                 563000
L480: WRITE(PRINT,FL485);                                            564000
GO TO L550;                                                          565000
L490: WRITE(PRINT,FL495);                                            566000
GO TO L550;                                                          567000
L500: WRITE(PRINT,FL505);                                            568000
GO TO L550;                                                          569000
L510: WRITE(PRINT,FL515);                                            570000
GO TO L550;                                                          571000
L520: WRITE(PRINT,FL525);                                            572000
GO TO L550;                                                          573000
L530: WRITE(PRINT,FL535);                                            574000
GO TO L550;                                                          575000
L540: WRITE(PRINT,FL545);                                            576000
```

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L550: JI+1;                                                          577000
DO BEGIN                                                             578000
  WRITE(PRINT,FL560,LIST9);                                          579000
  END UNTIL (JI+(JI+1))>JNRMAX;                                      580000
WRITE(PRINT,FL580,LIST10);                                           581000
IF (JNDMAX≤JNFORM) THEN GO TO L670;                                  582000
JNFORM+JNDMAX;                                                       583000
GO TO L440;                                                          584000
L600: WRITE(PRINT,FL605);                                            585000
GO TO L650;                                                          586000
L610: WRITE(PRINT,FL615);                                            587000
GO TO L650;                                                          588000
L620: WRITE(PRINT,FL625);                                            589000
L650: JI+1;                                                          590000
DO BEGIN                                                             591000
  WRITE(PRINT,FL560,LIST11);                                         592000
  END UNTIL (JI+(JI+1))>JNRMAX;                                      593000
WRITE(PRINT,FL580,LIST12);                                           594000
L670: WRITE(PRINT[PAGE]);                                            595000
      WRITE(PRINT,FL680);                                            596000
JI+1;                                                                597000
DO BEGIN                                                             598000
  WRITE(PRINT,FL690,LIST13);                                         599000
  END UNTIL (JI+(JI+1))>JNDMAX;                                      600000
 END END;                                                            601000
PROCEDURE SRAVRAGE;                                                  602000
BEGIN                                                                603000
INTEGER  DX1,JI,JJ,JK ,JINDX ;                                       604000
REAL JFPART,JFGROUP;                                                 605000
FORMAT FL110(" ",X29,"FLUXES FOR DEVIATION GROUP",I3,","),           606000
FL120(/" COLLISIONS",X30,"DETECTOR"),                                607000
FL145(/"                 01"),                                       608000
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FL155(/"              01         02"),                                    609000
FL165(/"              01         02         03"),                         610000
FL175(/"              01         02         03         04"),              611000
FL185(/"              01         02         03         04         05"),   612000
FL195(/                                                                   613000
   "              01         02         03         04         05  ",      614000
   "       06"),                                                          615000
FL205(/                                                                   616000
   "              01         02         03         04         05  ",      617000
   "       06         07"),                                              618000
FL220("    ",I2,X3,7E11.4),                                               619000
FL230(/"  TOTAL  ",7E11.4),                                               620000
FL265(/"              08"),                                              621000
FL275(/"              08         09"),                                   622000
FL285(/"              08         09         10"),                        623000
FL320(/" BASE FOR RANDOM NUMBER GENERATOR IS",I13),                       624000
FL400 (/" ",X11,                                                          625000
   " SCATTERED INTENSITIES VERSUS DETECTOR AND COLLISION NUMBER."),       626000
 FL450 (" ",X11,                                                          627000
    " INTENSITY DEVIATIONS VERSUS DETECTOR AND COLLISION NUMBER."));      628000
LIST LIST1(JNDEVG);                                                       629000
LIST LIST2(SVINCOL[JI],FOR DX1=1 STEP 1 UNTIL JNFORM DO SVAFLUX[          630000
 JI,DX1]);                                                                631000
LIST LIST3(FOR DX1=1 STEP 1 UNTIL JNFORM DO SVSTFLUX[DX1]);               632000
LIST LIST4(SVINCOL[JI],FOR DX1=8 STEP 1 UNTIL JNDMAX DO SVAFLUX[          633000
 JI,DX1]);                                                                634000
LIST LIST5(FOR DX1=8 STEP 1 UNTIL JNDMAX DO SVSTFLUX[DX1]);               635000
LIST LIST6(JIBASE);                                                       636000
LABEL L125,L130,L140,L150,L160,L170,L180,L190,L200,L210,L260,L270,        637000
 L280,L290,L310, L115, L410, L450;                                        638000
SWITCH SWG01=L140,L150,L160,L170,L180,L190,L200;                          639000
SWITCH SWG02=L260,L270,L280;                                              640000
```

```
JNDEVG←JNDEVG+1;                                                    641000
      JINDX ← 0 ;                                                   642000
JFPART←JNPART;                                                      643000
      JFGROUP ← JNGROUP ;                                           644000
JJ←1;                                                               645000
DO BEGIN                                                            646000
  SVSTFLUX[JJ]←0;                                                   647000
  JI←1;                                                             648000
  DO BEGIN                                                          649000
    SVAFLUX[JI,JJ]←SVAFLUX[JI,JJ]/JFPART;                           650000
    SVSAFLUX[JI,JJ]←SVSAFLUX[JI,JJ]+SVAFLUX[JI,JJ];                 651000
    SVSQFLUX[JI,JJ]←SVSQFLUX[JI,JJ]+SVAFLUX[JI,JJ]↑2;               652000
  SVSTFLUX[JJ]←SVSTFLUX[JJ]+SVAFLUX[JI,JJ];                         653000
    END UNTIL (JI←(JI+1))>JNPCOL;                                   654000
  SVFFLUX[JJ]←SVFFLUX[JJ]+SVSTFLUX[JJ];                            655000
  SVDVFLUX[JJ]←SVDVFLUX[JJ]+SVSTFLUX[JJ]↑2;                        656000
  END UNTIL (JJ←(JJ+1))>JNDMAX;                                     657000
WRITE(PRINT[PAGE]);                                                 658000
WRITE(PRINT,FL110,LIST1);                                           659000
L115: WRITE(PRINT,FL120);                                           660000
IF (JNDMAX>7) THEN GO TO L125;                                      661000
JNFORM←JNDMAX;                                                      662000
GO TO L130;                                                         663000
L125: JNFORM←7;                                                     664000
L130: GO TO SWGD1[JNFORM];                                          665000
L140: WRITE(PRINT,FL145);                                           666000
GO TO L210;                                                         667000
L150: WRITE(PRINT,FL155);                                           668000
GO TO L210;                                                         669000
L160: WRITE(PRINT,FL165);                                           670000
GO TO L210;                                                         671000
L170: WRITE(PRINT,FL175);                                           672000
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GO TO L210;                                                    673000
L180: WRITE(PRINT,FL185);                                      674000
GO TO L210;                                                    675000
L190: WRITE(PRINT,FL195);                                      676000
GO TO L210;                                                    677000
L200: WRITE(PRINT,FL205);                                      678000
L210: JI+1;                                                    679000
DO BEGIN                                                       680000
  WRITE(PRINT,FL220,LIST2);                                    681000
  END UNTIL (JI+(JI+1))>JNPCOL;                                682000
WRITE(PRINT,FL230,LIST3);                                      683000
IF (JNDMAX≤JNFORM) THEN GO TO L310;                            684000
JNFORM+JNDMAX-JNFORM;                                          685000
WRITE(PRINT[PAGE]);                                            686000
WRITE(PRINT,FL110,LIST1);                                      687000
WRITE(PRINT,FL120);                                            688000
GO TO SWGO?[JNFORM];                                           689000
L260: WRITE(PRINT,FL265);                                      690000
GO TO L290;                                                    691000
L270: WRITE(PRINT,FL275);                                      692000
GO TO L290;                                                    693000
L280: WRITE(PRINT,FL285);                                      694000
L290: JI+1;                                                    695000
DO BEGIN                                                       696000
  WRITE(PRINT,FL220,LIST4);                                    697000
  END UNTIL (JI+(JI+1))>JNPCOL;                                698000
WRITE(PRINT,FL230,LIST5);                                      699000
L310: WRITE(PRINT,FL320,LIST6);                                700000
JJ+1;                                                          701000
DO BEGIN                                                       702000
  JI+1;                                                        703000
  DO BEGIN                                                     704000
```

```
  SVAFLUX[JI,JJ]←0;                                                    705000
    END UNTIL (JI←(JI+1))>JNPCOL END  UNTIL (JJ←(JJ+1))>JNDMAX;        706000
IF (JNHIST<JNHMAX) THEN GO TO L450;                                    707000
IF (XPR←(JINDX))>0 THEN GO TO L450;                                    708000
IF XPR<0 THEN GO TO L410;                                              709000
JINDX←-1;                                                              710000
JJ←1;                                                                  711000
DO BEGIN                                                               712000
  JI←1;                                                                713000
  DO BEGIN                                                             714000
  SVAFLUX[JI,JJ]←SVSAFLUX[JI,JJ]/JFGROUP;                              715000
    END UNTIL (JI←(JI+1))>JNPCOL;                                      716000
  SVSTFLUX[JJ]←SVFFLUX[JJ]/JFGROUP;                                    717000
  END UNTIL (JJ←(JJ+1))>JNDMAX;                                        718000
WRITE(PRINT[PAGE]);                                                    719000
WRITE(PRINT,FL400);                                                    720000
GO TO L115;                                                            721000
L410: JINDX←1;                                                         722000
JJ←1;                                                                  723000
DO BEGIN                                                               724000
  JI←1;                                                                725000
  DO BEGIN                                                             726000
    SVAFLUX [JI,JJ]←SQRT((SVSQFLUX[JI,JJ]/JFGROUP↑2)-(SVSAFLUX[        727000
     JI,JJ])↑2/(JFGROUP↑3));                                           728000
    END UNTIL (JI←(JI+1))>JNPCOL;                                      729000
       SVSTFLUX[JJ]←SQRT((SVDVFLUX[JJ]/JFGROUP↑2)-(SVFFLUX[JJ]↑2/      730000
   JFGROUP↑3));                                                        731000
  END UNTIL (JJ←(JJ+1))>JNDMAX;                                        732000
WRITE(PRINT[PAGE]);                                                    733000
WRITE(PRINT,FL450);                                                    734000
GO TO L115;                                                            735000
L450:  END;                                                            736000
```

```
PROCEDURE SRANGLE;                                                    737000
BEGIN                                                                 738000
INTEGER  JJ,JI ;                                                      739000
COMMENT  THE FOLLOWING SUBROUTINES ARE REQUIRED:                      740000
    SRRANDA;                                                          741000
FORMAT FL15(/" NO ANGLE PROBABILITY COULD BE FOUND GREATER THAN",E10.3),  742000
FL34(/" INCORRECT SUBSCRIPT FOR ANGLE PROBABILITY.");                 743000
LIST LIST1(JRN);                                                      744000
LABEL L20,L35,L40,L45,L50;                                            745000
JI←1;                                                                 746000
DO BEGIN                                                              747000
  SRRANDA(JIBAS4,JRN);                                                748000
  JJ←1;                                                               749000
  DO BEGIN                                                            750000
    IF (SVPAG[JJ]≥JRN) THEN GO TO L20;                                751000
    END UNTIL (JJ←(JJ+1))>JNAG;                                       752000
  WRITE(PRINT,FL15,LIST1);                                            753000
  JWHOA←JWHOA+1;                                                      754000
  GO TO L50;                                                          755000
  L20: IF (JJ>1) THEN GO TO L35;                                      756000
  WRITE(PRINT,FL34);                                                  757000
  JWHOA←JWHOA+1;                                                      758000
  GO TO L50;                                                          759000
  L35: SRRANDA(JIBAS5,JRN);                                           760000
  SVSANG[JI]←SVCANG[JJ-1]-JRN×(SVCANG[JJ-1]-SVCANG[JJ]);              761000
  IF (XPR←(JNAOP))>0 THEN GO TO L40;                                  762000
  IF XPR<0 THEN GO TO L45;                                            763000
  JPJM1←SVPAG[JJ-1];                                                  764000
  SVWEIGHT[JI]←(1/(SVPAG[JJ]-JPJM1))×(SVCANG[JJ-1]-SVCANG[JJ])/(SVCANG[1  765000
]-SVCANG[JNAG]);                                                      766000
  GO TO L50;                                                          767000
  L40: SVWEIGHT[JI]←SVWAG[JJ];                                        768000
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  GO TO L50;                                                          769000
  L45: SVWEIGHT[JI]←1;                                                770000
  L50: END UNTIL (JI←(JI+1))>JNPART;                                  771000
 END;                                                                 772000
PROCEDURE SRPATHL;                                                    773000
BEGIN                                                                 774000
  INTEGER JJ;       REAL ADJUST ;                                     775000
COMMENT  THE FOLLOWING SUBROUTINES ARE REQUIRED:                      776000
    SRRANDA;                                                          777000
FORMAT FL130(/" LOC =",I4,"  J =",I4,"  JHR =",I4,"  JHT =",I4,"  RN =",  778000
S1,E10.3/"  RHO =",S1,E10.3,"  COTH =",S1,E10.3,"  TAUH1 =",S1,E10.3,    779000
   "  TAUH2 =",S1,E10.3/"  PL =",S1,E10.3,"  H2 =",S1,E10.3);           780000
LIST LIST1(JLOC,JJ,JJHB,JJHT,JRN,JRHO,JCOTH,JTAUH1,JTAUH2,JPL,JH2);    781000
LABEL L30,L50,L70,L100,L105,L140,L60,L110,L25;                         782000
SRRANDA(JIRAS2,JRN);                                                  783000
JLOC←25;                                                              784000
JPL←0;                                                                785000
IF (ABS(JCOTH) ≤ JSMVAL) THEN GO TO L25 ;                             786000
IF JCOTH>0 THEN GO TO L30;                                            787000
L25:  JRHO ← -LN(JRN) ;                                               788000
GO TO L50;                                                            789000
L30:  JUPLMIT ← (SVTAU[JNOH] - JTAUH1) / JCOTH ;                      790000
ADJUST ← 1 - EXP(-JUPLMIT) ;                                          791000
JRHO ← -LN(1 - JRN × ADJUST) ;                                        792000
JWAIT ← JWAIT × ADJUST ;                                              793000
L50: JTAUH2←JTAUH1+JRHO×JCOTH;                                        794000
IF (JTAUH2>0) THEN GO TO L60;                                         795000
JTAUH2←SVTAU[1];                                                      796000
  JH2←-JDLONG;                                                        797000
  JJHB←1;                                                             798000
JJHT←2;                                                               799000
GO TO L105;                                                           800000
```

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L60: JJ←1;                                                              801000
DO BEGIN                                                                802000
  IF (JTAUH2<SVTAU[JJ]) THEN GO TO L70;                                 803000
  END UNTIL (JJ←(JJ+1))>JNOH;                                           804000
JH2←JDLONG;                                                             805000
JJHB←JNOH-1;                                                            806000
JJHT←JNOH;                                                              807000
GO TO L105;                                                             808000
L70: JJHB←JJ-1;                                                         809000
JJHT←JJ;                                                                810000
IF (ABS(JCOTH)>JSMVAL) THEN GO TO L100;                                 811000
JH2←JH;                                                                 812000
JPL←JRHO/((SVTAU[JJHT]-SVTAU[JJHB])/(SVHV[JJHT]-SVHV[JJHB]));           813000
GO TO L110;                                                             814000
L100: JH2←SVHV[JJHB]+(SVHV[JJHT]-SVHV[JJHB])×(JTAUH2-SVTAU[JJHB])/(     815000
 SVTAU[JJHT]-SVTAU[JJHB]);                                              816000
L105: JPL←(JH2-JH1)/JCOTH;                                              817000
L110: IF JIDUMP≤0 THEN GO TO L140;                                      818000
WRITE(PRINT,FL130,LIST1);                                               819000
L140:  END;                                                             820000
PROCEDURE SRINITAL;                                                     821000
BEGIN                                                                   822000
INTEGER JJ,JI,JK,JN ;                                                   823000
JJ←1;                                                                   824000
DO BEGIN                                                                825000
  JLB←JNPCOL+1;                                                         826000
  JI←1;                                                                 827000
  DO BEGIN                                                              828000
    SVSAFLUX[JI,JJ]←0;                                                  829000
    SVSQFLUX[JI,JJ]←0;                                                  830000
      SVTFLUX[   JI,JJ]←0;                                              831000
    JK←1;                                                               832000
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    DO BEGIN                                                          833000
      SVFLUX[JK,JI,JJ]←0;                                             834000
      END UNTIL (JK←(JK+1))>JNPA;                                     835000
    END UNTIL (JI←(JI+1))>JLB;                                        836000
  JN←1;                                                               837000
  DO BEGIN                                                            838000
    SVFLUD[JN,JJ]←0;                                                  839000
    END UNTIL (JN←(JN+1))>JNRMAX;                                     840000
  SVRFLUX[JJ]←0;                                                      841000
  SVFFLUX[JJ]←0;                                                      842000
  SVDVFLUX[JJ]←0;                                                     843000
  SVFLUR[JJ]←0;                                                       844000
  END UNTIL (JJ←(JJ+1))>JNDMAX;                                       845000
    JMAXCOL ← 0;                                                      846000
    JNWAIT ← 0;                                                       847000
    JNOGO ← 0;                                                        848000
    JI ← 1;                                                           849000
    DO BEGIN                                                          850000
       SVNRICO[JI] ← 0 ;                                              851000
       END UNTIL(JI←(JI+1))>JNRMAX;                                   852000
 END;                                                                 853000
PROCEDURE SRREFLCT;                                                   854000
BEGIN                                                                 855000
REAL  JDENOM;       INTEGER   JI,JJAIL;                               856000
COMMENT  THE FOLLOWING SUBROUTINES ARE REQUIRED:                      857000
    SRRANDA;                                                          858000
FORMAT FL35(/" REFLECTION ANGLE DISTRIBUTION FOR BOUNDARY",I3,        859000
   " IS IN ERROR,");                                                  860000
LIST LIST1(JNRB);                                                     861000
LABEL L10,L15,L20,L33,L40,L60,L70,L80,L100;                           862000
SWITCH SWGO1←L10,L20,L15,L20;                                         863000
SRRANDA(JIBASE,JRN);                                                  864000
```

```
JNRB←JNCB;                                                          865000
JJAIL←SVJREFLT[JNRB];                                               866000
GO TO SWGO1[JJAIL];                                                 867000
L10: JCOTH1←JRN;                                                    868000
GO TO L70;                                                          869000
L15: JCOTH1←-JRN;                                                   870000
GO TO L70;                                                          871000
L20: JNRA←SVNRFCOS[JNRB];                                           872000
JFNRA←JNRA;                                                         873000
JI←1;                                                               874000
DO BEGIN                                                            875000
  JFI←JI;                                                           876000
  SVPRFLT[JI]←JFI/JFNRA;                                            877000
  IF (JRN≤SVPRFLT[JI]) THEN GO TO L40;                              878000
  END UNTIL (JI←(JI+1))>JNRA;                                       879000
L33: WRITE(PRINT,FL35,LIST1);                                       880000
JWHOA←JWHOA+1;                                                      881000
GO TO L100;                                                         882000
L40: IF (XPR←(JI-1))>0 THEN GO TO L60;                              883000
IF XPR<0 THEN GO TO L33;                                            884000
JCOTH1←1+(JRN/SVPRFLT[JI])×(SVRFLCOS[JI,JNRB]-1);                   885000
GO TO L70;                                                          886000
L60: JCOTH1←SVRFLCOS[JI-1,JNRB]+((JRN-SVPRFLT[JI-1])/(SVPRFLT[JI]-  887000
 SVPRFLT[JI-1]))×(SVRFLCOS[JI,JNRB]-SVRFLCOS[JI-1,JNRB]);           888000
L70: JSITH1←SQRT(1-JCOTH1↑2);                                       889000
L80: SRRANDA(JIBAS1,JRN);                                           890000
JSPT←2×JRN-1;                                                       891000
SRRANDA(JIBAS3,JRN);                                                892000
JCPT←2×JRN-1;                                                       893000
JDENOM←JCPT↑2+JSPT↑2;                                               894000
IF (JDENOM>1) THEN GO TO L80;                                       895000
JDENOM←SQRT(JDENOM);                                                896000
```

```
JCPHI1←JCPT/JDENOM;                                                    897000
JSPHI1←JSPT/JDENOM;                                                    898000
L100: END;                                                             899000
PROCEDURE SRSCTANG;                                                    900000
BEGIN                                                                  901000
REAL  JCOPHI, JSOPHI;   INTEGER  JI,JNPASE ;                           902000
COMMENT  THE FOLLOWING SUBROUTINES ARE REQUIRED:                       903000
    SRREFLCT, SRRANDA;                                                 904000
FORMAT FL80(/" THE PHASE ANGLE PROBABILITIES FOR MATERIAL",I3,          905000
   " ARE INCORRECT."),                                                 906000
FL139(/" LOC =",I4," NPHASE =",I4," NCM =",I4," REFL =",E10.3,          907000
   "  CSANG =",E10.3/" SSANG =",E10.3," CTEP =",E10.3," STEP =",E10.3, 908000
"  DEOM =",E10.3," CDPHI =",E10.3/" SDPHI =",E10.3," COTH2 =",E10.3,    909000
   "  SITH2 =",E10.3," SDEPHI =",E10.3/" CDEPHI =",E10.3," CPHI2 =",   910000
   E10.3," SPHI2 =",E10.3," COTH1 =",E10.3/" SITH1 =",E10.3,           911000
   "  CPHI1 =",E10.3," SPHI1 =",E10.3," RN =",E10.3);                  912000
LIST LIST1(JNCM);                                                      913000
LIST LIST2(JLOC,JNPHASE,JNCM,JREFL,JCSANG,JSSANG,JCTEP,JSTEP,JDEOM,    914000
 JCDPHI,JSDPHI,JCOTH2,JSITH2,JSDEPHI,JCDEPHI,JCPHI2,JSPHI2,JCOTH1,     915000
 JSITH1,JCPHI1,JSPHI1,JRN);                                            916000
LABEL L5,L10,L50,L90,L110,L120,L130,L137,L140;                          917000
IF JREFL≤0 THEN GO TO L5;                                              918000
SRREFLCT;                                                              919000
GO TO L137;                                                            920000
L5: SRRANDA(JIBAS4,JRN);                                               921000
IF (JRN> JRATLEE)        THEN GO TO L50;                               922000
L10: SRRANDA(JIBAS5,JRN);                                              923000
JCSANG←1-2×JRN;                                                        924000
SRRANDA(JIBASE,JRN);                                                   925000
IF (JRN≤.5) THEN GO TO L120;                                           926000
SRRANDA(JIBAS1,JRN);                                                   927000
IF (JRN>JCSANG×JCSANG) THEN GO TO L10 ELSE GO TO L120;                 928000
```

```
L50: SRRANDA(JIBAS2,JRN);                                                    929000
JNPASE←SVNPHANG[JNCM];                                                       930000
JFNPA←JNPASE;                                                                931000
JI←1;                                                                        932000
DO BEGIN                                                                     933000
  JFI←JI;                                                                    934000
  SVPFANG[JI]←JFI/JFNPA;                                                     935000
  IF (JRN≤SVPFANG[JI]) THEN GO TO L90;                                       936000
  END UNTIL (JI←(JI+1))>JNPASE;                                              937000
WRITE(PRINT,FL80,LIST1);                                                     938000
JWHOA←JWHOA+1;                                                               939000
GO TO L140;                                                                  940000
L90: IF (JFI>1) THEN GO TO L110;                                             941000
JCSANG←1+(JRN/SVPFANG[JI])×(SVPHANG[JI,JNCM]-1);                             942000
GO TO L120;                                                                  943000
L110: JCSANG←SVPHANG[JI-1,JNCM]+((JRN-SVPFANG[JI-1])/(SVPFANG[JI]-           944000
 SVPFANG[JI-1]))×(SVPHANG[JI,JNCM]-SVPHANG[JI-1,JNCM]);                      945000
L120: JSSANG←SQRT(1-JCSANG×JCSANG);                                          946000
L130: SRRANDA(JIBAS3,JRN);                                                   947000
JCTEP←1-2×JRN;                                                               948000
SRRANDA(JIBAS4,JRN);                                                         949000
JSTEP←1-2×JRN;                                                               950000
JDEOM←JCTEP↑2+JSTEP↑2;                                                       951000
IF (JDEOM>1) THEN GO TO L130;                                                952000
JDEOM←SQRT(JDEOM);                                                           953000
JCDPHI←JCTEP/JDEOM;                                                          954000
JSDPHI←JSTEP/JDEOM;                                                          955000
 IF JSITH2 < JSMVAL THEN BEGIN JCOTH1 ← JCSANG×JCOTH2                        956000
 JSITH1 ← JSSANG;                                                            957000
JCPHI1 ← JCDPHI;                                                             958000
 JSPHI1 ← JSDPHI;                                                            959000
 END ELSE BEGIN                                                              960000
```

```
JCOTH1←JCOTH2×JCSANG+JSITH2×JSSANG×JCDPHI;                              961000
JSITH1←SQRT(1-JCOTH1×JCOTH1);                                           962000
JSDEPHI←(JSSANG×JSDPHI)/JSITH1;                                         963000
JCDEPHI←(JCSANG-JCOTH1×JCOTH2)/(JSITH1×JSITH2);                         964000
JCPHI1←JCPHI2×JCDEPHI-JSPHI2×JSDEPHI;                                   965000
JSPHI1←JSPHI2×JCDEPHI+JCPHI2×JSDEPHI;                                   966000
 END;                                                                   967000
L137: JCOTH2←JCOTH1;                                                    968000
JSITH2←JSITH1;                                                          969000
JCPHI2←JCPHI1;                                                          970000
JSPHI2←JSPHI1;                                                          971000
JLOC←80;                                                                972000
IF JIDUMP≤0 THEN GO TO L140;                                            973000
WRITE(PRINT,FL139,LIST2);                                               974000
L140:  END;                                                             975000
PROCEDURE SRDBEAM;                                                      976000
BEGIN                                                                   977000
INTEGER JJ, JJ2;  REAL   JVD;                                           978000
COMMENT  THE FOLLOWING SUBROUTINES ARE REQUIRED:                        979000
    SRDSTBD, SRSEARCH;                                                  980000
FORMAT FL11(" HS IS GREATER THAN HV(NOH).                      "),      981000
       FL230(" RADIATION RESEARCH ASSOCIATES -LITE- PROBLEM",I10),      982000
FL240(/" DIRECT BEAM LIGHT INTENSITIES"//                               983000
   "  DETECTOR   DIRECT INTENSITY"),                                    984000
FL250(/" ",I6,X8,E11.4);                                                985000
LIST LIST1(JNPROB);                                                     986000
LIST LIST2(JJ,SVDBFLUX[JJ]);                                            987000
LABEL L3,L100,L210,L300,L280;                                           988000
JJ2←2;                                                                  989000
DO BEGIN                                                                990000
  IF (JHS≤SVHV[JJ2]) THEN GO TO L3;                                     991000
  END UNTIL (JJ2←(JJ2+1))>JNOH;                                         992000
```

```
WRITE(PRINT,FL11)$                                                    993000
GO TO L300$                                                           994000
L3: JJHB←JJ2-1$                                                       995000
JJHT←JJ2$                                                             996000
JJ←1$                                                                 997000
DO BEGIN                                                              998000
  JVO←SVHD[JJ]-JHS$                                                   999000
  JT←SQRT(JVO↑2+SVRO[JJ]↑2)$                                         1000000
  JCOTH←JVO/JT$                                                      1001000
  IF (ABS(JCOTH)>JSMVAL) THEN GO TO L100$                            1002000
      JRHOT←JT×(SVTAU[JJHT]-SVTAU[JJHB])/(SVHV[JJHT]-SVHV[JJHB])$    1003000
      GO TO L210$                                                    1004000
      L100: JRHOT ← (SVTAUHD[JJ]-JTAUH )/JCOTH$                      1005000
  L210: SVDBFLUX[JJ]←SVDBSS[JJ]×EXP(-JRHOT)/JT↑2$                    1006000
  END UNTIL (JJ←(JJ+1))>JNDMAX$                                      1007000
WRITE(PRINT[PAGE])$                                                  1008000
WRITE(PRINT,FL230,LIST1)$                                            1009000
WRITE(PRINT,FL240)$                                                  1010000
JJ←1$                                                                1011000
DO BEGIN                                                             1012000
  WRITE(PRINT,FL250,LIST2)$                                          1013000
  END UNTIL (JJ←(JJ+1))>JNDMAX$                                      1014000
WRITE(PRINT[PAGE])$                                                  1015000
L280: JWHOA←JWHOA+1$                                                 1016000
L300:  END$                                                          1017000
PROCEDURE SRCHECK$                                                   1018000
BEGIN                                                                1019000
INTEGER   JI1,JINAG,JINPA,JINPCOL,JINRF1,JINRF2,JINRF,JJCHECH,JJCHECK,  1020000
        JJ,JNRF1,JNRF2,JNRF3,JNRF,JNAG1,JNPA1,JNPCOL1 $              1021000
FORMAT FL25("  THE NUMBER OF REFLECTION BOUNDRIES",I3,               1022000
   " EXCEEDS THE LIMIT OF 5 ALLOWED",".DATA CHECK CONTINUES..."),    1023000
FL45("  THE NUMBER OF OETECTORS",I3," EXCEEDS THE LIMIT OF 10 ALLOWED",  1024000
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   ".DATA CHECK CONTINUES..."),                                          1025000
FL65("  THE NUMBER OF MATERIALS",I3," EXCEEDS THE LIMIT OF 10 ALLOWED",  1026000
   ".DATA CHECK CONTINUES..."),                                          1027000
FL85("  THE NUMBER OF PRINT COLLISIONS",I3,                            1028000
   " EXCEEDS THE LIMIT OF 24 ALLOWED","DATA CHECK CONTINUES..."),        1029000
FL105("  THE NUMBER OF PRINT ANGLES",I3,                               1030000
   " EXCEEDS THE LIMIT OF 25 ALLOWED","DATA CHECK CONTINUES..."),        1031000
FL125("  THE NUMBER OF SOURCE ANGLES",I3,                              1032000
   " EXCEEDS THE LIMIT OF 37 ALLOWED","DATA CHECK CONTINUES..."),        1033000
FL145("  THE NUMBER OF REGIONS",I4," EXCEEDS THE LIMIT OF  50 ALLOWED", 1034000
   ".DATA CHECK CONTINUES..."),                                          1035000
FL165("  THE NUMBER OF BOUNDRIES",I4,                                  1036000
   " EXCEEDS THE LIMIT OF  50 ALLOWED","DATA CHECK CONTINUES..."),       1037000
FL180("  COSINE SOURCE ANGLES MUST BE INPUT IN DESCENDING ORDER",      1038000
   ".DATA CHECK CONTINUES..."),                                          1039000
FL215("  COSINE PRINT ANGLES MUST BE INPUT IN DESCENDING ORDER",       1040000
   ".DATA CHECK CONTINUES..."),                                          1041000
FL235(" REFLECTION ANGLES MUST BE INPUT IN DESCENDING ORDER",          1042000
   ".DATA CHECK CONTINUES..."),                                          1043000
FL270("  REFLECTION COSINES MUST BE INPUT IN DESCENDING ORDER",        1044000
   ".DATA CHECK CONTINUES..."),                                          1045000
FL315("  DIFFERENTIAL COSINES MUST BE INPUT IN DESCENDING ORDER",      1046000
   ".DATA CHECK CONTINUES..."),                                          1047000
FL355("  PHASE ANGLES MUST BE INPUT IN DESCENDING ORDER",              1048000
   ".DATA CHECK CONTINUES..."),                                          1049000
FL385("  ANGLE PROBABILITIES MUST BE INPUT IN ASCENDING ORDER",        1050000
   ".DATA CHECK CONTINUES..."),                                          1051000
FL415("  INPUT NUMBER OF COLLISSION MUST BE IN ASCENDING ORDER",       1052000
   ".DATA CHECK CONTINUES..."),                                          1053000
FL435(" ","  THERE ARE A TOTAL OF",I5," INPUT DATA ERRORS"///           1054000
   "TAKE PROBLEM OFF COMPUTER AND CORRECT ERRORS. BETTER LUCK NEXT ",    1055000
   "TIME"),                                                              1056000
```

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FL455(" INPUT DATA SEEMS TO BE ALLRIGHT. EXECUTION CONTINUES.");                1057000
LIST LIST1(JNRFLB);                                                             1058000
LIST LIST2(JNDMAX);                                                             1059000
LIST LIST3(JNMAT);                                                              1060000
LIST LIST4(JNPCOL);                                                             1061000
LIST LIST5(JNPA);                                                               1062000
LIST LIST6(JNAG);                                                               1063000
LIST LIST7(JNRMAX);                                                             1064000
LIST LIST8(JNBMAX);                                                             1065000
LIST LIST9(JJCHECK);                                                            1066000
LABEL L30,L50,L70,L90,L110,L130,L150,L170,L200,L220,L240,L280,L300,              1067000
 L320,L360,L370,L390,L420,L450;                                                 1068000
JJCHECK←0;                                                                      1069000
IF (JNRFLB≤5) THEN GO TO L30;                                                   1070000
WRITE(PRINT,FL25,LIST1);                                                        1071000
JJCHECK←JJCHECK+1;                                                              1072000
L30: IF (JNDMAX≤10) THEN GO TO L50;                                             1073000
WRITE(PRINT,FL45,LIST2);                                                        1074000
JJCHECK←JJCHECK+1;                                                              1075000
L50: IF (JNMAT≤10) THEN GO TO L70;                                              1076000
WRITE(PRINT,FL65,LIST3);                                                        1077000
JJCHECK←JJCHECK+1;                                                              1078000
L70: IF (JNPCOL≤24) THEN GO TO L90;                                             1079000
WRITE(PRINT,FL85,LIST4);                                                        1080000
JJCHECK←JJCHECK+1;                                                              1081000
L90: IF (JNPA≤25) THEN GO TO L110;                                              1082000
WRITE(PRINT,FL105,LIST5);                                                       1083000
JJCHECK←JJCHECK+1;                                                              1084000
L110: IF (JNAG≤37) THEN GO TO L130;                                             1085000
WRITE(PRINT,FL125,LIST6);                                                       1086000
JJCHECK←JJCHECK+1;                                                              1087000
L130: IF (JNRMAX≤50) THEN GO TO L150;                                           1088000
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WRITE(PRINT,FL145,LIST7);                                          1089000
JJCHECK←JJCHECK+1;                                                 1090000
L150: IF (JNBMAX≤50) THEN GO TO L170;                              1091000
WRITE(PRINT,FL165,LIST8);                                          1092000
JJCHECK←JJCHECK+1;                                                 1093000
JNAG1←JNAG-1;                                                      1094000
L170: JJ←1;                                                        1095000
DO BEGIN                                                           1096000
  IF (SVCANG[JJ]≥SVCANG[JJ+1]) THEN GO TO L200;                    1097000
  WRITE(PRINT,FL180);                                              1098000
  JJCHECK←JJCHECK+1;                                               1099000
  L200: END UNTIL (JJ←(JJ+1))>JNAG1;                               1100000
JNPA1←JNPA-1;                                                      1101000
JJ←1;                                                              1102000
DO BEGIN                                                           1103000
  IF (SVCIPA[JJ]≥SVCIPA[JJ+1]) THEN GO TO L220;                    1104000
  WRITE(PRINT,FL215);                                              1105000
  JJCHECK←JJCHECK+1;                                               1106000
  L220: END UNTIL (JJ←(JJ+1))>JNPA1;                               1107000
IF JNRFLB≤0 THEN GO TO L300;                                       1108000
JI1←1;                                                             1109000
DO BEGIN                                                           1110000
  JNRF←SVNRFANG[JI1]-1;                                            1111000
  JJ←1;                                                            1112000
  DO BEGIN                                                         1113000
    IF (SVRFANG[JJ,JI1]≥SVRFANG[JJ+1,JI1]) THEN GO TO L240;        1114000
    WRITE(PRINT,FL235);                                            1115000
    JJCHECK←JJCHECK+1;                                             1116000
    L240: END UNTIL (JJ←(JJ+1))>JNRF;                              1117000
  END UNTIL (JI1←(JI1+1))>JNRFLB;                                  1118000
JI1←1;                                                             1119000
DO BEGIN                                                           1120000
```

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  JNRF1←SVNRFCOS[JI1]-1;                                          1121000
  JJ←1;                                                           1122000
  DO BEGIN                                                        1123000
    IF (SVRFLCOS[JJ,JI1]≥SVRFLCOS[JJ+1,JI1]) THEN GO TO L280;     1124000
    WRITE(PRINT,FL270);                                           1125000
    JJCHECK←JJCHECK+1;                                            1126000
    L280: END UNTIL (JJ←(JJ+1))>JNRF1;                            1127000
  END UNTIL (JI1←(JI1+1))>JNRFLR;                                 1128000
L300: JI1←1;                                                      1129000
DO BEGIN                                                          1130000
  IF (SVRAYLEE[JI1]=1) THEN GO TO L370;                           1131000
  JNRF2←SVNDFCOS[JI1]-1;                                          1132000
  JJ←1;                                                           1133000
  DO BEGIN                                                        1134000
    IF (SVDIFCOS[JJ,JI1]≥SVDIFCOS[JJ+1,JI1]) THEN GO TO L320;     1135000
    WRITE(PRINT,FL315);                                           1136000
    JJCHECK←JJCHECK+1;                                            1137000
    L320: END UNTIL (JJ←(JJ+1))>JNRF2;                            1138000
  JNRF3←SVNPHANG[JI1]-1;                                          1139000
  JJ←1;                                                           1140000
  DO BEGIN                                                        1141000
    IF (SVPHANG[JJ,JI1]≥SVPHANG[JJ+1,JI1]) THEN GO TO L360;       1142000
    WRITE(PRINT,FL355);                                           1143000
    JJCHECK←JJCHECK+1;                                            1144000
    L360: END UNTIL (JJ←(JJ+1))>JNRF3;                            1145000
  L370: END UNTIL (JI1←(JI1+1))>JNMAT;                            1146000
JNAG1←JNAG-1;                                                     1147000
JJ←1;                                                             1148000
DO BEGIN                                                          1149000
  IF (SVPAG[JJ]≤SVPAG[JJ+1]) THEN GO TO L390;                     1150000
  WRITE(PRINT,FL385),                                             1151000
  JJCHECK←JJCHECH+1;                                              1152000
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  L390: END UNTIL (JJ+(JJ+1))>JNAG1;                                    1153000
JNPCOL1+JNPCOL-1;                                                       1154000
JJ+1;                                                                   1155000
DO BEGIN                                                                1156000
  IF (SVINCOL[JJ]≤SVINCOL[JJ+1]) THEN GO TO L420;                       1157000
  WRITE(PRINT,FL415);                                                   1158000
  JJCHECK+JJCHECK+1;                                                    1159000
  L420: END UNTIL (JJ+(JJ+1))>JNPCOL1;                                  1160000
IF JJCHECK≤0 THEN GO TO L450;                                           1161000
WRITE(PRINT[PAGE]);                                                     1162000
WRITE(PRINT,FL435,LIST9);                                               1163000
ERROR(0);                                                               1164000
L450: WRITE(PRINT,FL455);                                               1165000
 END;                                                                   1166000
PROCEDURE SRMAIN;                                                       1167000
BEGIN                                                                   1168000
INTEGER   JJAIL, JJ2;                                                   1169000
REAL JFRACT;                                                            1170000
COMMENT  THE FOLLOWING SUBROUTINES ARE REQUIRED:                        1171000
    SRINITAL, SRSEARCH, SRAVRAGE, SRANSWER, SRANGLE, SRPATHL, SRDSTBD,  1172000
   SRRANDA, SRDETECT, SRSCTANG;                                         1173000
FORMAT FL11(" HS IS GREATER THAN HV(NOH).                    "),        1174000
       FL6(/" CANNOT LOCATE REGION CONTAINING SOURCE PARTICLE."),       1175000
FL76(/" LOC =",I4," NPART =",I4," NSP =",I4," NHIST =",I6," NCR =",     1176000
   I4," NCOL =",I4/" H1 =",E10.3," R1 =",E10.3," COTH1 =",E10.3,        1177000
   " SITH1 =",E10.3/" CPHI1 =",E10.3," SPHI1 =",E10.3," WAIT =",       1178000
   E10.3),                                                              1179000
FL96(/" LOC =",I4," NCR =",I4," NCM =",I3," R =",E10.3," H =",E10.3/   1180000
" COTH =",E10.3," SITH =",E10.3," CIPH =",E10.3," SPHI =",E10.3),       1181000
FL106(/" A NEGATIVE OR ZERO PATH LENGTH WAS GENERATED, PL=",E10.3),     1182000
FL136(/" PROGRAM FAILED TO CALCULATE DISTANCE TO A BOUNDARY."),         1183000
FL142(/" LOC =",I4," NCR =",I4," NCB =",I4," T =",E10.3," SUMDST =",    1184000
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E10.3/" DIST =",E10.3,"  RHOT =",E10.3,"  DT =",E10.3,"  HT =",E10.3/      1185000
   " RHO =",E10.3,"  NCM =",I4,"  NLM =",I4),                              1186000
FL147(/" LOC =",I4,"  NCM =",I4,"  NLM =",I4,"  H =",E10.3,"  TS =",       1187000
   E10.3/" RT =",E10.3,"  CPHI =",E10.3,"  R =",E10.3),                    1188000
FL177(/" CANNOT FIND REGION CONTAINING PARTICLE COORDINATES,  H=",E10.3,   1189000
"  R=",E10.3),                                                             1190000
FL264(/" LOC =",I4,"  NCR1 =",I4,"  NCR2 =",I4,"  DIST =",E10.3,          1191000
   "  DT =",E10.3/" T =",E10.3,"  SUMDST =",E10.3,"  H2 =",E10.3,          1192000
   "  TS =",E10.3/" RT =",E10.3,"  CPHI2 =",E10.3,"  R2 =",E10.3,          1193000
   "  SPHI2 =",E10.3/" COTH2 =",E10.3,"  SITH2 =",E10.3,"  NCOL =",I4);   1194000
LIST LIST1(JLOC,JNPART,JNSP,JNHIST,JNCR,JNCOL,JH1,JR1,JCOTH1,JSITH1,       1195000
 JCPHI1,JSPHI1,JWAIT);                                                     1196000
LIST LIST2(JLOC,JNCR,JNCM,JR,JH,JCOTH,JSITH,JCPHI,JSPHI);                 1197000
LIST LIST3(JPL);                                                          1198000
LIST LIST4(JLOC,JNCR,JNCB,JT,JSUMDST,JDIST,JRHOT,JDT,JHT,JRHO,JNCM,JNLM)  1199000
 ;                                                                        1200000
LIST LIST5(JLOC,JNCM,JNLM,JH,JTS,JRT,JCPHI,JR);                           1201000
LIST LIST6(JH,JR);                                                        1202000
LIST LIST7(JNLM);                                                         1203000
LIST LIST8(JLOC,JNCR1,JNCR2,JDIST,JDT,JT,JSUMDST,JH2,JTS,JRT,JCPHI2,JR2,  1204000
 JSPHI2,JCOTH2,JSITH2,JNCOL);                                             1205000
BEGIN                                                                     1206000
LABEL L7,L10,L60,L70,L80,L100,L110,L120,L130,L140,L144,L150,L161,          1207000
L3, L8, L1600,                                                            1208000
 L165,L166,L170,L180,L310,L188,L2,                L250,L260,L268,         1209000
 L320,L340,L350;                                                          1210000
SWITCH SWGO1=L165,L165,L161,L161;                                         1211000
JNPART=JNHMAX DIV JNGROUP;                                                1212000
JNSP=JNPART+1;                                                            1213000
JNHIST=0;                                                                 1214000
JNDEVG=0;                                                                 1215000
SRINITAL;                                                                 1216000
```

```
JMPREG←JNSOREG;                                                    1217000
JWHOA←0;                                                           1218000
JH←JHS;                                                            1219000
JR←0;                                                              1220000
JJ2←2;                                                             1221000
DO BEGIN                                                           1222000
  IF (XPR←(JHS-SVHV[JJ2]))≠0 THEN GO TO L2;                        1223000
  IF XPR<0 THEN GO TO L3;                                          1224000
  END UNTIL (JJ2←(JJ2+1))>JNOH;                                    1225000
WRITE(PRINT,FL11);                                                 1226000
GO TO L350;                                                        1227000
L3: JTAUH←SVTAU[JJ2-1]+(SVTAU[JJ2]-SVTAU[JJ2-1])×(JHS-SVHV[JJ2-1])/(  1228000
 SVHV[JJ2]-SVHV[JJ2-1]);                                           1229000
GO TO L8;                                                          1230000
L2: JTAUH←SVTAU[JJ2];                                              1231000
L8: JERRORS←JWHOA;                                                 1232000
SRSEARCH;                                                          1233000
IF (JERRORS<JWHOA) THEN GO TO L340;                                1234000
IF (JNCR=JNSOREG) THEN GO TO L7;                                   1235000
WRITE(PRINT,FL6);                                                  1236000
GO TO L350;                                                        1237000
L7: JREFL←0;                                                       1238000
L10: IF (XPR←(JNPART-JNSP))>0 THEN GO TO L70;                      1239000
IF XPR<0 THEN GO TO L60;                                           1240000
SRAVRAGE;                                                          1241000
IF (JNHIST<JNHMAX) THEN GO TO L60;                                 1242000
SRANSWER;                                                          1243000
GO TO L350;                                                        1244000
L60: SRANGLE;                                                      1245000
IF (JERRORS<JWHOA) THEN GO TO L340;                                1246000
JNSP←0;                                                            1247000
L70: JNHIST←JNHIST+1;                                              1248000
```

```
JNREFL←1;                                                    1249000
JLOC←10;                                                     1250000
JTAUH2←JTAUH;                                                1251000
JNSP←JNSP+1;                                                 1252000
JH1←JHS;                                                     1253000
JR1←0;                                                       1254000
JNCR←JNSOREG;                                                1255000
JCOTH1←SVSANG[JNSP];                                         1256000
JSITH1←SQRT(1-JCOTH1×JCOTH1);                                1257000
JCPHI1←1;                                                    1258000
JSPHI1←0;                                                    1259000
JWAIT←SVWEIGHT[JNSP];                                        1260000
JNCOL←1;                                                     1261000
IF JIDUMP≤0 THEN GO TO L80;                                  1262000
WRITE(PRINT,FL76,LIST1);                                     1263000
L80: JR←JR1;                                                 1264000
JLOC←20;                                                     1265000
JTAUH1←JTAUH2;                                               1266000
JH←JH1;                                                      1267000
JREFL←0;                                                     1268000
JCOTH←JCOTH1;                                                1269000
JSITH←JSITH1;                                                1270000
JCPHI←JCPHI1;                                                1271000
JSPHI←JSPHI1;                                                1272000
JNCR1←JNCR;                                                  1273000
JNCM←SVMAT[JNCR];                                            1274000
IF JIDUMP≤0 THEN GO TO L100;                                 1275000
WRITE(PRINT,FL96,LIST2);                                     1276000
L100: SRPATHL;                                               1277000
IF (JERRORS<JWHOA) THEN GO TO L340;                          1278000
IF JPL>0 THEN GO TO L110;                                    1279000
WRITE(PRINT,FL106,LIST3);                                    1280000
```

```
 JWHOA←JWHOA+1;                                                          1281000
GO TO L340;                                                              1282000
L110: JT←JPL;                                                            1283000
JRHOT←0;                                                                 1284000
L120: JDT←0;                                                             1285000
JSUMDST←0;                                                               1286000
JHT←JH;                                                                  1287000
L130: $RDSTBD;                                                           1288000
IF (JERRORS<JWHOA) THEN GO TO L340;                                      1289000
IF JNCB≥0 THEN GO TO L140;                                               1290000
WRITE(PRINT,FL136);                                                      1291000
GO TO L350;                                                              1292000
L140: JSUMDST←JSUMDST+JDIST;                                             1293000
JLOC←50;                                                                 1294000
IF JIDUMP≤0 THEN GO TO L144;                                             1295000
WRITE(PRINT,FL142,LIST4);                                                1296000
L144: IF (JSUMDST≥JT) THEN GO TO L250;                                   1297000
JNCM←SVMAT[JNCR];                                                        1298000
JH←JH+JCOTH×JDIST;                                                       1299000
JTS←JDIST×JSITH;                                                         1300000
JRT←SQRT(JR×JR+JTS×JTS+2×JR×JTS×JCPHI);                                  1301000
 IF JRT < JSMVAL THEN BEGIN JCPHI ← 1 ;JSPHI ← 0 ; END  ELSE BEGIN       1302000
JCPHI←(JTS+JR×JCPHI)/JRT;                                                1303000
JSPHI←JR×JSPHI/JRT;                                                      1304000
 END;                                                                    1305000
JR←JRT;                                                                  1306000
JNLM←JNCM;                                                               1307000
JLOC←60;                                                                 1308000
IF JIDUMP≤0 THEN GO TO L150;                                             1309000
WRITE(PRINT,FL147,LIST5);                                                1310000
L150: IF (SVNBOUND[JNCB])≥0 THEN GO TO L170;                             1311000
JH2←JH-2×JDELTA×JCOTH;                                                   1312000
```

```
JR2←JR-2×JDELTA×JSITH×JCPHI;                                    1313000
IF (JNCB≠1) THEN GO TO L1600;                                   1314000
JNREFL ← JNREFL + 1 ;                                           1315000
IF (JNREFL-JMAXR≤1) THEN GO TO L1600;                           1316000
JNMAXR←JNMAXR+1;                                                1317000
GO TO L10;                                                      1318000
L1600: JREFL←1;                                                 1319000
JNRB←JNCB;                                                      1320000
JJAIL←SVJREFLT[JNRB];                                           1321000
GO TO SWGO1[JJAIL];                                             1322000
L161: JCOTH2←-1;                                                1323000
GO TO L166;                                                     1324000
L165: JCOTH2←1;                                                 1325000
L166: JSITH?←0;                                                 1326000
JCPHI2←1;                                                       1327000
JSPHI2←0;                                                       1328000
JWAIT←JWAIT×SVALBEDO[JNCB];                                     1329000
GO TO L260;                                                     1330000
L170: JMPREC←SVMPR[JJ1,JNCR];                                   1331000
SRSEARCH;                                                       1332000
IF (JERRORS<JWHOA) THEN GO TO L340;                             1333000
IF JNCR>0 THEN GO TO L180;                                      1334000
WRITE(PRINT,FL177,LIST6);                                       1335000
GO TO L350;                                                     1336000
L180: JNCR2←JNCR;                                               1337000
      IF (SVEMP[JNCR2]≥SVEMP[JNCR1]) THEN GO TO L188;           1338000
SRRANDA(JIBAS5,JRN);                                            1339000
IF (JRN>(SVEMP[JNCR2]/SVEMP[JNCR1])) THEN GO TO L310;           1340000
JWAIT←JWAIT×(SVEMP[JNCR1]/SVEMP[JNCR2]);                        1341000
GO TO L188;                                                     1342000
L310: SVNRICO[JNCR2]←SVNRICO[JNCR2]+1;                          1343000
JNRSTOP←JNRSTOP+1;                                              1344000
```

```
GO TO L10;                                                                    1345000
L188: JOT←JDT+JDIST;                                                          1346000
JNCM←SVMAT[JNCR];                                                             1347000
GO TO L130;                                                                   1348000
L250: JDIST←JT-JDT;                                                           1349000
JH2←JH+JCOTH×JDIST;                                                           1350000
JTS←JDIST×JSITH;                                                              1351000
JRT←SQRT(JR×JR+JTS×JTS+2×JR×JTS×JCPHI);                                       1352000
 IF JRT < JSMVAL THEN BEGIN JCPHI2← 1 ;JSPHI2← 0 ; END  ELSE BEGIN            1353000
JCPHI2←(JTS+JR×JCPHI)/JRT;                                                    1354000
JSPHI2←JR×JSPHI/JRT;                                                          1355000
 END;                                                                         1356000
JR2←JRT;                                                                      1357000
JCOTH2←JCOTH;                                                                 1358000
JSITH2←JSITH;                                                                 1359000
JFRACT←(JH2-SVHV[JJHB])/(SVHV[JJHT]-SVHV[JJHB]);                              1360000
JRATLEE←SVRAYR[JJHB]+(SVRAYR[JJHT]-SVRAYR[JJHB])×JFRACT;                      1361000
SVCRATIO[JNCM]←SVSCATR[JJHB]+(SVSCATR[JJHT]-SVSCATR[JJHB])×JFRACT;            1362000
JWAIT←JWAIT×SVCRATIO[JNCM];                                                   1363000
L260: JNCR2←JNCR;                                                             1364000
JLOC←70;                                                                      1365000
IF JIOUMP≤0 THEN GO TO L268;                                                  1366000
WRITE(PRINT,FL264,LIST8);                                                     1367000
L268: SROETECT;                                                               1368000
IF (JERRORS<JWHOA) THEN GO TO L340;                                           1369000
JNCOL←JNCOL+1;                                                                1370000
IF (JNCOL≤JNCMAX) THEN GO TO L320;                                            1371000
JMAXCOL←JMAXCOL+1;                                                            1372000
JNOGO←JNOGO+1;                                                                1373000
GO TO L10;                                                                    1374000
    L320: JNOGO ←JNOGO + 1;                                                   1375000
    SRSCTANG;                                                                 1376000
```

```
IF (JERRORS<JWHOA) THEN GO TO L340;                                    1377000
JR1←JR2;                                                               1378000
JH1←JH2;                                                               1379000
JNCR←JNCR2;                                                            1380000
IF (JWAIT>JWCO) THEN GO TO L80;                                        1381000
JNWAIT←JNWAIT+1;                                                       1382000
GO TO L10;                                                             1383000
L340: IF (JWHOA>JELIM) THEN GO TO L350;                                1384000
JERRORS←JWHOA;                                                         1385000
GO TO L10;                                                             1386000
L350:  END END;                                                        1387000
PROCEDURE MAINPRO;                                                     1388000
BEGIN                                                                  1389000
INTEGER JI1,JI2,JI3,JI4,JICHECK,JJATL,JLIS1,JLIS2,I,J;                 1390000
INTEGER  DX1,DX2;                                                      1391000
COMMENT  THE FOLLOWING SUBROUTINES ARE REQUIRED:                       1392000
    SRCHECK, SRMAIN, SRDBEAM;                                          1393000
FORMAT FL10(5I10),                                                     1394000
FL110(2I10,4R10.4),                                                    1395000
FL130(6R10.4),                                                         1396000
FL170(4R10.4),                                                         1397000
FL210(2I10,R10.4),                                                     1398000
FL230(3I5,R5.2,8I5),                                                   1399000
FL310(2R10.4,I10,R10.4),                                               1400000
FL330(/" SVHD[J] IS GREATER THAN SVHV[JNOH] FOR J =",I4,               1401000
 ".."),                                                                1402000
FL350 (/"I=",I4,"J=",I4,"TAUHD[I]=",S1,E10.3),                         1403000
FL410(6I10),                                                           1404000
FL510(R10.4),                                                          1405000
FL810(6I10),                                                           1406000
FL905(/                                                                1407000
   " THE NUMBER OF HISTORIES WAS NOT EQUALLY DIVISIBLE BY  THE NUMB",  1408000
```

```
   "ER OF DEVIATION GROUPS."/"  THE NUMBER OF HISTORIES WAS  RESET TO",  1409000
   I6),                                                                 1410000
FL920(/" INPUT NUMBER OF MATERIALS DOES NOT AGREE WITH NMAT. "),        1411000
FL950(/" INPUT NUMBER OF BOUNDARIES DOES NOT AGREE WITH NBMAX."),       1412000
FL980(/" INPUT NUMBER OF REGIONS DOES NOT AGREE WITH NRMAX."),          1413000
FL1010(/" INPUT NUMBER OF DETECTORS DOES NOT AGREE WITH NDMAX."),       1414000
FL1040(/" INPUT NUMBER OF PRINT COLLISIONS DOES NOT AGREE WITH NPCOL."), 1415000
FL1070(/" INPUT NUMBER OF PRINT COSINES DOES NOT AGREE WITH NPA."),     1416000
FL2000(/                                                                1417000
   " INPUT NUMBER OF REFLECTION BOUNDARIES DOES NOT AGREE WITH NRFL",   1418000
   "B."),                                                               1419000
FL2030(/" INPUT SOURCE ANGLE OPTION DOES NOT AGREE WITH NAOP."),        1420000
FL2060(/" INPUT NUMBER OF SOURCE ANGLES DOES NOT AGREE WITH NAG."));    1421000
LIST LIST1(JLIBRAY,JI1,JI2,JI3,JI4);                                    1422000
LIST LIST21 (FOR DX1=1 STEP 1 UNTIL JNDH DO [SVHV[DX1],SVTAU[DX1],      1423000
 SVSCATR[DX1],  SVRAYR[DX1]]);                                          1424000
LIST LIST2(SVNDFCOS[JI1],SVNPHANG[JI1],SVSIGNOT[JI1],SVRAYLEE[JI1],SVA[ 1425000
 JI1],SVCRATIO[JI1]);                                                   1426000
LIST LIST3(FOR DX1=1 STEP 1 UNTIL JLIS1 DO SVDIFCOS[DX1,JI1]);          1427000
LIST LIST4(FOR DX1=1 STEP 1 UNTIL JLIS1 DO SVPOCOS[DX1,JI1]);           1428000
LIST LIST5(FOR DX1=1 STEP 1 UNTIL JLIS2 DO SVPHANG[DX1,JI1]);           1429000
LIST LIST6(FOR DX1=1 STEP 1 UNTIL JI1 DO [SVNBOUND[DX1],SVITYPE[        1430000
 DX1],SVCOEE[DX1]]);                                                    1431000
LIST LIST7(FOR DX1=1 STEP 1 UNTIL JI2 DO [SVNREG[DX1],SVNB[DX1],SVMAT[  1432000
 DX1],SVEMP[DX1],FOR DX2=1 STEP 1 UNTIL 4 DO [SVIB[DX2,DX1],SVMPR[      1433000
 DX2,DX1]]]);                                                           1434000
LIST LIST8(FOR DX1=1 STEP 1 UNTIL JI1 DO [SVHD[DX1],SVRD[DX1],SVNPHID[  1435000
 DX1],SVDBSS[DX1]]);                                                    1436000
LIST LIST9(FOR DX1=1 STEP 1 UNTIL JI1 DO SVINCOL[DX1]);                 1437000
LIST LIST10(FOR DX1=1 STEP 1 UNTIL JI2 DO SVCIPA[DX1]);                 1438000
LIST LIST11(SVALBEDO[JI1]);                                             1439000
LIST LIST12(FOR DX1=1 STEP 1 UNTIL JI3 DO SVRFANG[DX1,JI1]);            1440000
```

```
LIST LIST13(FOR DX1←1 STEP 1 UNTIL JI3 DO SVPOR[DX1,JI1])$                    1441000
LIST LIST14(FOR DX1←1 STEP 1 UNTIL JI4 DO SVRFLCOS[DX1,JI1])$                 1442000
LIST LIST15(FOR DX1←1 STEP 1 UNTIL JI2 DO SVCANG[DX1])$                       1443000
LIST LIST16(FOR DX1←1 STEP 1 UNTIL JI2 DO SVPAG[DX1])$                        1444000
LIST LIST17(FOR DX1←1 STEP 1 UNTIL JI2 DO SVWAG[DX1])$                        1445000
LIST LIST18(JHS,JDLONG,JDELTA,JSMVAL,JWCO,JELIM,JDMIN)$                       1446000
LIST LIST19(JNHMAX,JNGROUP,JNRMAX,JNBMAX,JNCMAX,JNOMAX,JNPA,JNPCOL,           1447000
 JNAOP,JNAG,JNRFLB,JNMAT,JNSOREG,JMAXR,JIBASE,JIBAS1,JIBAS2,JIBAS3,           1448000
 JIBAS4, JIBAS5)$                                                             1449000
LIST LIST20(JNHMAX)$                                                          1450000
LIST LIST23 (I, J, SVTAUHD[I]) $                                              1451000
LIST LIST22(I)$                                                               1452000
LABEL L5,L100,L200,L300,L400,L500,L520,L600,L700,L800,L900,L908,L930,          1453000
    L5A,L5AA,L150,L170,L190,L506,L507,L508,L320,L390,L850,                    1454000
 L960,L990,L1020,L1050,L1080,L2010,L2040,L2070,L2087,L3000$                   1455000
SWITCH SWGO1←L800,L700,L600,L500,L400,L300,L200,L100,L850,L900,L3000$          1456000
SWITCH SWGO2←L5,L520,L5,L520$                                                 1457000
JNMATP←0$                                                                     1458000
JNBMAXP←0$                                                                    1459000
JNRMAXP←0$                                                                    1460000
JNRFLBP←0$                                                                    1461000
JNOMAXP←0$                                                                    1462000
JNPCOLP←0$                                                                    1463000
JNPAP←0$                                                                      1464000
JNAGP←0$                                                                      1465000
L5A:READ(DAT,10,ABC[*])[L5AA]$  WRITE (CARD,10,ABC[*])$  GO TO L5A$           1466000
L5AA:REWIND(CARD)$   CLOSE(DAT,RELEASE)$                                      1467000
L5: READ(CARD,FL10,LIST1)[FINIS]$                                             1468000
JNOGO←0$                                                                      1469000
GO TO SWGO1[JLIBRAY]$                                                         1470000
L100: JNMATP←JNMATP+1$                                                        1471000
SVMATERL[JNMATP]←JI1$                                                         1472000
```

```
            I←1;                                                    1473000
         DO BEGIN                                                   1474000
            IF SVMATERL[I]≠SVMATERL[JNMATP] THEN                    1475000
            GO TO L150;                                             1476000
            IF I≠JNMATP THEN GO TO L170;                            1477000
L150:       END UNTIL (I←(I+1))> JNMATP;                            1478000
            GO  TO  L190;                                           1479000
L170:       JNMATP← JNMATP-1;                                       1480000
L190:       READ (CARD, FL110, LIST2);                              1481000
JLIS1←SVNDFCOS[JI1];                                                1482000
JLIS2←SVNPHANG[JI1];                                                1483000
IF (SVRAYLEE[JI1]≥1) THEN GO TO L5;                                 1484000
READ(CARD,FL130,LIST3);                                             1485000
READ(CARD,FL130,LIST4);                                             1486000
READ(CARD,FL130,LIST5);                                             1487000
GO TO L5;                                                           1488000
L200: JNRMAXP←JI1;                                                  1489000
JNRMAXP←JI2;                                                        1490000
READ(CARD,FL210,LIST6);                                             1491000
READ(CARD,FL230,LIST7);                                             1492000
GO TO L5;                                                           1493000
L300: JNDMAXP←JI1;                                                  1494000
READ(CARD,FL310,LIST8);                                             1495000
GO TO L5;                                                           1496000
L400: JNPCOLP←JI1;                                                  1497000
JNPAP←JI2;                                                          1498000
READ(CARD,FL410,LIST9);                                             1499000
READ(CARD,FL130,LIST10);                                            1500000
GO TO L5;                                                           1501000
L500: JNRFLBP←JNRFLBP+1;                                            1502000
SVJREFLT[JI1]←JI2;                                                  1503000
          NRFB[JNRFLBP]←JI1;                                        1504000
```

```
    I←1;                                                          1505000
        DO BEGIN                                                  1506000
    IF NRFB[I]≠NRFB[JNRFLBP] THEN                                 1507000
            GO  TO  L507;                                         1508000
            IF I≠JNRFLBP THEN GO TO L506;                         1509000
L507;       END UNTIL (I←(I+1)) > JNRFLBP;                        1510000
    GO TO L508;                                                   1511000
L506:    JNRFLBP←JNRFLBP-1;                                       1512000
    L508: READ (CARD,FL510,LIST11);                               1513000
JJAIL←SVJREFLT[JI1];                                              1514000
GO TO SWGO2[JJAIL];                                               1515000
L520: SVNRFANG[JI1]←JI3;                                          1516000
READ(CARD,FL130,LIST12);                                          1517000
READ(CARD,FL130,LIST13);                                          1518000
SVNRFCOS[JI1]←JI4;                                                1519000
READ(CARD,FL130,LIST14);                                          1520000
GO TO L5;                                                         1521000
L600: JNAOPP←JI1;                                                 1522000
JNAGP←JI2;                                                        1523000
READ(CARD,FL130,LIST15);                                          1524000
READ(CARD,FL130,LIST16);                                          1525000
IF JNAOPP≤0 THEN GO TO L5;                                        1526000
READ(CARD,FL130,LIST17);                                          1527000
GO TO L5;                                                         1528000
L700: READ(CARD,FL130,LIST18);                                    1529000
GO TO L5;                                                         1530000
L800: READ(CARD,FL810,LIST19);                                    1531000
GO TO L5;                                                         1532000
L850: JNOH←JI1;                                                   1533000
READ (CARD,FL170,LIST21);                                         1534000
GO TO L5;                                                         1535000
L900: JNPROB←JI1;                                                 1536000
```

```
JIDUMP←JI2;                                                    1537000
JICHECK←JI3;                                                   1538000
JNPART←JNHMAX DIV JNGROUP;                                     1539000
IF (JNHMAX=JNPART×JNGROUP) THEN GO TO L908;                    1540000
JNHMAX←JNPART×JNGROUP;                                         1541000
WRITE(PRINT,FL905,LIST20);                                     1542000
L908: IF (JNMATP=JNMAT) THEN GO TO L930;                       1543000
WRITE(PRINT,FL920);                                            1544000
JNOGO←JNOGO+1;                                                 1545000
L930: IF (JNBMAXP=JNBMAX) THEN GO TO L960;                     1546000
WRITE(PRINT,FL950);                                            1547000
JNOGO←JNOGO+1;                                                 1548000
L960: IF (JNRMAXP=JNRMAX) THEN GO TO L990;                     1549000
WRITE(PRINT,FL980);                                            1550000
JNOGO←JNOGO+1;                                                 1551000
L990: IF (JNOMAXP=JNOMAX) THEN GO TO L1020;                    1552000
WRITE(PRINT,FL1010);                                           1553000
JNOGO←JNOGO+1;                                                 1554000
L1020: IF (JNPCOLP=JNPCOL) THEN GO TO L1050;                   1555000
WRITE(PRINT,FL1040);                                           1556000
JNOGO←JNOGO+1;                                                 1557000
L1050: IF (JNPAP=JNPA) THEN GO TO L1080;                       1558000
WRITE(PRINT,FL1070);                                           1559000
JNOGO←JNOGO+1;                                                 1560000
L1080: IF (JNRFLBP=JNRFLB) THEN GO TO L2010;                   1561000
WRITE(PRINT,FL2000);                                           1562000
JNOGO←JNOGO+1;                                                 1563000
L2010: IF (JNAOPP=JNAOP) THEN GO TO L2040;                     1564000
WRITE(PRINT,FL2030);                                           1565000
JNOGO←JNOGO+1;                                                 1566000
L2040: IF (JNAGP=JNAG) THEN GO TO L2070;                       1567000
WRITE(PRINT,FL2060);                                           1568000
```

```
JNOGO←JNOGO+1;                                                    1569000
L2070: IF JNOGO>0 THEN GO TO L5;                                  1570000
IF JICHECK≤0 THEN GO TO L2087;                                    1571000
SRCHECK;                                                          1572000
L2087: I← 1;                                                      1573000
DO BEGIN                                                          1574000
J← 2;                                                             1575000
DO BEGIN                                                          1576000
IF (SVHD[I]>SVHV[J])THEN GO TO L320;                              1577000
SVTAUHD[I]←SVTAU[J-1]+(SVTAU[J] -SVTAU[J-1])×(SVHD[I]-SVHV[J-1])/ 1578000
 (SVHV[J]-SVHV[J-1]);                                             1579000
IF (JIDUMP ≤ 0) THEN GO TO L390 ;                                 1580000
WRITE (PRINT, FL350, LIST23) ;                                    1581000
 GO TO L390;                                                      1582000
L320: END UNTIL (J←(J+1) )>JNOH;                                  1583000
WRITE (PRINT,FL330,LIST22);                                       1584000
L390: END UNTIL(I←(I+1))>JNDMAX;                                  1585000
       SRMAIN;                                                    1586000
SRDBEAM;                                                          1587000
GO TO L5;                                                         1588000
L3000: ERROR(0);                                                  1589000
 END;                                                             1590000
COMMENT  INITIALIZING BLOCK;                                      1591000
  XPR←Q←K←0;                                                      1592000
 SENSW[1]←FALSE;                                                  1593000
 SENSW[2]←FALSE;                                                  1594000
 SENSW[3]←FALSE;                                                  1595000
 SENSW[4]←FALSE;                                                  1596000
 SENSW[5]←FALSE;                                                  1597000
 SENSW[6]←FALSE;                                                  1598000
 SENSL[1]←FALSE;                                                  1599000
 SENSL[2]←FALSE;                                                  1600000
```

```
 SENSL[3]←FALSE;                                                          1601000
 SENSL[4]←FALSE)                                                          1602000
MAINPROJ FINIS: END;                                                      1603000
LKNJA←(TIMF(2)-LKNJA)/60;DKVQK←(TIMF(3)-DKVQK)/60;FZOVC←TIME(1);BLZAT;WR  1604000
ITE(PRINT[PAGE]);WRITE(PRINT,CHGUB,100×LJLDU+GCPOV,LKNJA,DKVQK);          1605000
END.                                                                      1606000
```

5.2 ALGOL LISTINGS FOR THE LITE-II CODE

```
BEGIN FILE OUT PRINT 1          (2,15)}INTEGER XRAZQ,VVUWU,FZOVC,LKNJA,DK      1000
VQK,QRANI,LJLDU,GCPDV}INTEGER ARRAY ZIKLA,QNCCL[0:12]}FORMAT HHFRK("TIME      2000
 ON  ",I4,X96,I2,X1,A3," 1965"),CHGUR("TIME OFF ",I4,X30,"PRDC. TIME =",     3000
I10," SECS",X20,"I/D TIME =",I10," SECS")}DEFINE BLZAT=LJLDU+FZOVC DIV 2     4000
16000}GCPDV+FZOVC MOD 216000/3600#}FILL ZIKLA[*]WITH 0,31,59,90,120,151,     5000
181,212,24_,273,304,334,366}FILL QNCCL[*]WITH 0,"JAN","FEB","MAR","APR",     6000
"MAY","JUN","JUL","AUG","SEP","OCT","NOV","DEC"}FZOVC+TIME(1)}LKNJA+TIME     7000
(2)}DKVQK+TIME(3)}VVUWU+TIME(0)}QRANI+100*VVUWU.[30:6]+10*VVUWU.[36:6]+V     8000
VUWU.[42:6]}XRAZQ+1}WHILE QRANI≥ZIKLA[XRAZQ]DO XRAZQ+XRAZQ+1}QRANI+QRANI     9000
-ZIKLA[XRAZQ-1]}BLZAT}WRITE(PRINT[PAGE],HHFRK,100*LJLDU+GCPDV,QRANI,QNCC     10000
L[XRAZQ])}                                                                   11000
BEGIN                                                                        12000
FILE    CARD  (2,10)}          FILE IN DAT (2,10)}                           13000
FILE DUT PUNCH 0(2,10)}                                                      14000
FILE XXXXXX 2(2,15)}                                                         15000
SWITCH FILE FILESW+XXXXXX}                                                   16000
LABEL  FINIS}                                                                17000
BOOLEAN ARRAY  SENSL[0:4], SFNSW[0:6]}                                       18000
REAL ARRAY                                                                   19000
     ABC[0:20],                                                              20000
     SVTFLUX[0:25,     0:10],                                                21000
      SVFLUX[0:25,0:25,0:10],                                                22000
      SVDIFCDS[0:50,0:10 ],                                                  23000
      SVPDCOS [0:50,0:10 ],                                                  24000
      SVPHANG [0:50,0:10 ],                                                  25000
      SVAFLUX [0:25,0:10 ],                                                  26000
      SVPOR   [0:37,0:5  ],                                                  27000
      SVRFANG [0:37,0:5  ],                                                  28000
      SVSAFLUX[0:25,0: 10],                                                  29000
      SVSQFLUX[0:25,0:10 ],                                                  30000
      SVFLUD  [0:50,0:10 ],                                                  31000
      SVRFLCDS[0:50,0:10 ],                                                  32000
```

```
      SVA      [0:10 ],                                                  33000
      SVCANG   [0:37 ],                                                  34000
      SVEMP    [0:50 ],                                                  35000
      SVFLUR   [0:10 ],                                                  36000
      SVCIPA   [0:25 ],                                                  37000
      SVFFLUX  [0:10 ],                                                  38000
      SVALBEDO[0:5  ],                                                   39000
      SVCOEE   [0:50 ],                                                  40000
      SVOVFLUX[0:10 ],                                                   41000
      SVHO     [0:10 ],                                                  42000
      SVPAG    [0:37 ],                                                  43000
      SVRAYLEE[0:10 ],                                                   44000
      SVSANG   [0:500],                                                  45000
      SVSTFLUX[0:10 ],                                                   46000
      SVWEIGHT[0:500],                                                   47000
      SVOBFLUX[0:10 ],                                                   48000
      SVPFANG  [0:50 ],                                                  49000
      SVWAG    [0:37 ],                                                  50000
      SVPRFLT  [0:50 ],                                                  51000
      SVRO     [0:10 ],                                                  52000
      SVRFLUX  [0:10 ],                                                  53000
      SVSIGNOT[0:10 ],                                                   54000
      SVSUMRHO[0:50 ],                                                   55000
      SVCRATIO [0:10] ,                                                  56000
      SVHV[0:100],                                                       57000
      SVTAU[0:100],                                                      58000
SVSCATR[0:100],                                                          59000
      SVRAYR[0:100],                                                     60000
      SVTAUHO[0:10],                                                     61000
      SVOBSS   [0:10 ];                                                  62000
INTEGER ARRAY                                                            63000
      SVIB     [0:4 ,0:50 ],                                             64000
```

```
      SVMPR   [0:4 ,0:50 ],                                              65000
      SVJREFLT[0:5  ],                                                   66000
      SVNDFCOS[0:10 ],                                                   67000
      SVNREG  [0:50 ],                                                   68000
      SVINCDL [0:25 ],                                                   69000
      SVMAT   [0:50 ],                                                   70000
      SVNB    [0:50 ],                                                   71000
      SVNPHANG[0:10 ],                                                   72000
      SVNRFANG[0:5  ],                                                   73000
      SVNRICO [0:50 ],                                                   74000
      SVITYPE [0:50 ],                                                   75000
      SVMATERL[0:10 ],                                                   76000
      SVNBOUND[0:50 ],                                                   77000
      SVNPHID [0:10 ],                                                   78000
    NRFB[0:5],                                                           79000
      SVNRFCOS[0:5  ];                                                   80000
REAL                                                                     81000
    JALPHA ,    JBETA  ,    JBRAC  ,    JCDEPHI,    JCOTH  ,           82000
    JCOTH1 ,    JCOTH2 ,    JCPA   ,    JCPHI  ,    JCPHI1 ,           83000
    JCPHI2 ,    JCPHID ,    JCPRRD ,    JCPT   ,    JCSA   ,           84000
    JCSANG ,    JCTEP  ,    JDELTA ,    JDEOM  ,    JDIFH  ,           85000
    JDIST  ,    JDLONG ,    JDOM   ,    JDT    ,    JEAH   ,           86000
    JELIM  ,    JFI    ,    JFNPA  ,    JFNRA  ,    JH     ,           87000
    JH1    ,    JH2    ,    JHS    ,    JHT    ,                      88000
                                        JPAG   ,    JPJM1  ,           89000
    JPL    ,    JPSCAT ,    JR     ,    JR1    ,    JR2    ,           90000
    JREFL  ,    JRESULT,    JRHO   ,    JRHOT  ,    JRN    ,           91000
    JRRD2  ,    JRRDSQ ,    JRT    ,    JSDEPHI,    JSITH  ,           92000
    JSITH1 ,    JSITH2 ,    JSMVAL ,    JSOD   ,    JSPHI  ,           93000
    JSPHI1 ,    JSPHI2 ,    JSPHID ,    JSPT   ,    JSSANG ,           94000
    JSTEP  ,    JSUMDST,    JSUMSQ ,    JT     ,    JTEMP  ,           95000
    JTS    ,    JUPLMIT,    JWAIT  ,    JWCO   ,    JWHDA  ,           96000
```

```
  JRATLEE, JTAUH, JTAUH1, JTAUH2,                                          97000
    JX     ,   JXR    ,   JERRORS,   JDMIN  ;                             98000
INTEGER                                                                    99000
      JJHB, JJHT, JNREFL, JMAXR, JNMAXR, JIBAS1, JIBAS2,                   100000
      JIBAS3, JIBAS4, JIBAS5, JNOH,                                        101000
                                                    JIBASE ,               102000
    JICB   ,   JIDUMP ,   JJ1    ,   JKA1   ,   JKA2   ,                  103000
    JKA3   ,   JKA4   ,   JLA    ,   JLB    ,   JLIBRAY,                  104000
    JLOC   ,   JLP    ,   JLSR   ,   JLST   ,   JMAT1  ,                  105000
    JMAT2  ,   JMAXCOL,   JMPREG ,   JNAG   ,   JNAGP  ,                  106000
    JNAOP  ,   JNAOPP ,   JNBMAX ,   JNBMAXP,   JNCB   ,                  107000
    JNCM   ,   JNCMAX ,   JNCOL  ,   JNCR   ,   JNCR1  ,                  108000
    JNCR2  ,   JNCYC  ,   JNDEVG ,   JNDMAX ,   JNDMAXP,                  109000
    JNFORM ,   JNGROUP,   JNHIST ,   JNHMAX ,   JNLB   ,                  110000
    JNLM   ,   JNMAT  ,   JNMATP ,   JNOGO  ,   JNPA   ,                  111000
    JNPAP  ,   JNPART ,   JNPHASE,   JNPCOL ,   JNPCOLP,                  112000
    JNPROB ,   JNRA   ,   JNRFLB ,   JNRFLBP,   JNRING ,                  113000
    JNRMAX ,   JNRMAXP,   JNRSTOP,   JNSOREG,   JNSY   ,                  114000
    JNSP   ,   JNUB   ,   JNWAIT ,   K,  JNRB ;                           115000
REAL  Q,XPR;                                                               116000
FORMAT F(///////"STOP / PAUSE  NO. ",I5);                                  117000
REAL PROCEDURE INT(ARG1);          VALUE ARG1;        REAL ARG1;           118000
   INT←SIGN(ARG1)×ENTIER(ABS(ARG1));                                       119000
REAL PROCEDURE TANH(ARG1);         VALUE ARG1;        REAL ARG1;           120000
   TANH←((Q←EXP(ARG1×2))-1)/(Q+1);                                         121000
REAL PROCEDURE MAX(ARG1,ARG2);     VALUE ARG1,ARG2;   REAL ARG1,ARG2;      122000
   MAX←IF ARG1≥ARG2 THEN ARG1 ELSE ARG2;                                   123000
REAL PROCEDURE MIN(ARG1,ARG2);     VALUE ARG1,ARG2;   REAL ARG1,ARG2;      124000
   MIN←IF ARG1≤ARG2 THEN ARG1 ELSE ARG2;                                   125000
REAL PROCEDURE DIM(ARG1,ARG2);     VALUE ARG1,ARG2;   REAL ARG1,ARG2;      126000
   DIM←MAX(ARG1-ARG2,0);                                                   127000
PROCEDURE ERROR(ARG1);             VALUE ARG1;        REAL ARG1;           128000
```

```
BEGIN WRITE(PRINT,F,ARG1); GO TO FINIS END;                          129000
PROCEDURE SRRANDA(JIBASE,JRN);                                       130000
INTEGER JIBASE;                                                      131000
REAL JRN;                                                            132000
BEGIN INTEGER A, B;                                                  133000
      A.[12:18] ← JIBASE.[30:18];                                    134000
      B.[12:35] ← JIBASE.[13:35];                                    135000
      JIBASE.[12:36] ← A+B+JIBASE;                                   136000
      A ← +0;                                                        137000
      A.[21:27] ← JIBASE.[12:27];                                    138000
      JRN ← A;                                                       139000
      JRN ← JRN/134217728.0;                                         140000
END SRRANDA;                                                         141000
PROCEDURE SRSEARCH;                                                  142000
BEGIN                                                                143000
INTEGER   JI,JJ,JK;                                                  144000
FORMAT FL23(/" BOUNDARY",I3," HAS BEEN INCORRECTLY IDENTIFIED."),    145000
FL37(/" POINT LIES ON BOUNDARY",I3),                                 146000
FL85(/" SEARCH CYCLE THROUGH REGIONS IS NOT HANDELED PROPERLY."),    147000
FL95(/" CANNOT FIND REGION FOR POINT WITH COORDINATES R = ",E10.3,   148000
   ", H = ",E10.3);                                                  149000
LIST LIST1(JNCB);                                                    150000
LIST LIST2(JH,JR);                                                   151000
LABEL L5,L10,L20,L25,L30,L35,L38,L40,L50,L60,L80,L90,L97,L100;        152000
L5: JNSY←0;                                                          153000
JNLB←JMPREG;                                                         154000
JNUB←JNRMAX;                                                         155000
L10: JK←JNLB;                                                        156000
DO BEGIN                                                             157000
  JJ←SVNB[JK];                                                       158000
  JI←1;                                                              159000
  DO BEGIN                                                           160000
```

```
      JNCB←ABS(SVIB[JI,JK]);                                          161000
      IF (XPR←(SVITYPE[JNCB]-1))>0 THEN GO TO L30;                    162000
      IF XPR=0 THEN GO TO L25;                                        163000
      L20: WRITE(PRINT,FL23,LIST1);                                   164000
      JWHOA←JWHOA+1;                                                  165000
      GO TO L50;                                                      166000
      L25: JYR←SVCOEE[JNCB]*JH;                                       167000
      GO TO L35;                                                      168000
      L30: JXR←SVCOEE[JNCB]*JR;                                       169000
      L35: IF (XPR←(JXR))>0 THEN GO TO L40;                           170000
      IF XPR<0 THEN GO TO L38;                                        171000
      WRITE(PRINT,FL37,LIST1);                                        172000
      JH←JH+JDELTA×JCOTH;                                             173000
      JR←JR+JDELTA×JSITH×JCPHI;                                       174000
      GO TO L5;                                                       175000
      L38: IF (XPR←(SVIB[JI,JK]))>0 THEN GO TO L60;                   176000
      IF XPR=0 THEN GO TO L20 ELSE GO TO L50;                         177000
      L40: IF (XPR←(SVIB[JI,JK]))=0 THEN GO TO L20;                   178000
      IF XPR<0 THEN GO TO L60;                                        179000
      L50: END UNTIL (JI←(JI+1))>JJ;                                  180000
    JNCR←JK;                                                          181000
    GO TO L100;                                                       182000
    L60: END UNTIL (JK←(JK+1))>JNUB;                                  183000
IF (XPR←(JNSY))>0 THEN GO TO L90;                                     184000
IF XPR<0 THEN GO TO L80;                                              185000
JNSY←1;                                                               186000
JNLB←1;                                                               187000
JNUB←JMPREG;                                                          188000
GO TO L10;                                                            189000
L80: WRITE(PRINT,FL85);                                               190000
JWHOA←JWHOA+1;                                                        191000
GO TO L97;                                                            192000
```

```
L90: WRITE(PRINT,FL95,LIST2);                                          193000
JWHOA←JWHOA+1;                                                         194000
L97: JNCR←0;                                                           195000
L100:  END;                                                            196000
PROCEDURE SRDSTBD;                                                     197000
BEGIN                                                                  198000
INTEGER      JJ,JK;                                                    199000
COMMENT  THE FOLLOWING SUBROUTINES ARE REQUIRED:                       200000
    SRSEARCH;                                                          201000
FORMAT FL15(" BOUNDARY",I3," HAS BEEN IDENTIFIED INCORRECTLY."),       202000
FL55(/" LOC =",I4,"  ICB =",I4,"  X =",E10.3,"  BRAC =",E10.3,         203000
   "  DIST =",E10.3/" H =",E10.3,"  R =",E10.3,"  CDEE(ICB) =",E10.3,  204000
   "  ITYPE(ICB) =",I4),                                               205000
FL75(/" COLLISION POINT IS WITHIN A DISTANCE OF 1.1 DELTA FROM BOUNDAR",206000
"Y",I4,".  IT WAS MOVED OFF THE BOUNDARY.");                           207000
LIST LIST1(JICB);                                                      208000
LIST LIST2(JLOC,JICB,JX,JBRAC,JDIST,JH,JR,SVCDEE[JICB],SVITYPE[        209000
 JICB]);                                                               210000
LIST LIST3(JNCB);                                                      211000
LABEL L5,L20,L30,L36,L38,L39,L56,L60,L80;                              212000
JNCB←0;                                                                213000
JJ1←1;                                                                 214000
JLOC←105;                                                              215000
L5: JDIST←JDLONG;                                                      216000
JK←SVNB[JNCR];                                                         217000
JJ←1;                                                                  218000
DO BEGIN                                                               219000
  JICB←ABS(SVIB[JJ,JNCR]);                                             220000
  IF (XPR←(SVITYPE[JICB]-1))>0 THEN GO TO L30;                         221000
  IF XPR=0 THEN GO TO L20;                                             222000
  WRITE(PRINT,FL15,LIST1);                                             223000
  JWHOA←JWHOA+1;                                                       224000
```

```
  GO TO L80;                                                          225000
  L20: IF (ABS(JCOTH)≤JSMVAL) THEN GO TO L60;                         226000
  JX←(SVCOEE[JICB]-JH)/JCOTH;                                         227000
  GO TO L39;                                                          228000
  L30: IF (ABS(JSITH)≤JSMVAL) THEN GO TO L60;                         229000
  JBRAC←(SVCOEE[JICB]↑2-(JR×JSPHI)↑2);                                230000
  IF JBRAC≤0 THEN GO TO L60;                                          231000
  IF (XPR←(SVCOEE[JICB]-JR))>0 THEN GO TO L38;                        232000
  IF XPR<0 THEN GO TO L36;                                            233000
  JMPREG←JNCR;                                                        234000
  SRSEARCH;                                                           235000
  IF (JERRORS≥JWHOA) THEN GO TO L5 FLSE GO TO L80;                    236000
  L36: JX←(-JR×JCPHI-SQRT(JBRAC))/JSITH;                              237000
  GO TO L39;                                                          238000
  L38: JX←(-JR×JCPHI+SQRT(JBRAC))/JSITH;                              239000
  L39: IF JIDUMP≤0 THEN GO TO L56;                                    240000
  WRITE(PRINT,FL55,LIST2);                                            241000
  L56: IF JX≤0 THEN GO TO L60;                                        242000
  IF (JDIST≤JX) THEN GO TO L60;                                       243000
  JDIST←JX+JDELTA;                                                    244000
  JNCB←JICB;                                                          245000
  JJ1←JJ;                                                             246000
  L60: END UNTIL (JJ←(JJ+1))>JK;                                      247000
IF (JDIST≥1.1×JDELTA) THEN GO TO L80;                                 248000
WRITE(PRINT,FL75,LIST3);                                              249000
JH←JH+JDELTA×JCOTH;                                                   250000
JR←JR+JDELTA×JSITH×JCPHI;                                             251000
JMPREG←SVMPR[JJ1,JNCR];                                               252000
SRSEARCH;                                                             253000
IF JNCR>0 THEN GO TO L5;                                              254000
L80:  END;                                                            255000
PROCEDURE SRDETECT;                                                   256000
```

```
BEGIN                                                                   257000
   INTEGER JL, JM, JLC, JI, JJ3, JJ2;                                   258000
FORMAT FL190(" LOC =",I4," LA =",I4," LC =",I4," LP =",I4,              259000
   " NCR1 =",I4/" COTH =",S1,E13.3," I =",I4," H2 =",S1,E13.3,          260000
   " HD[I] =",S1,E13.3),                                                261000
      FL240(" LOC= ",I4," J2 =",I4/" RESULT=",S1,E10.3," FLUX =",       262000
        S1, E13.3,                                                      263000
   " FLUD =",S1,E13.3," RFLUX =",S1,E13.3," REFL =",S1,E10.3," AFLUX =", 264000
S1,E13.3);                                                              265000
LIST LIST1(JLOC, JLA, JLC, JLP, JNCR1, JCOTH, JI, JH2, SVHD[JI]);       266000
LIST LIST2(JLOC,JJ2, JRESULT,SVFLUX[JLA,JLP,JJ2],SVFLUD[JNCR2,JJ2],     267000
    SVRFLUX[JJ2],JREFL, SVAFLUX[JLC,JJ2]);                              268000
LABEL L20,L40,L60,L70,L90,L100,L120,L130,L150,L160,L170,L200,L220,       269000
 L250,L300;                                                             270000
COMMENT  CALCULATION OF FLUX CROSSING ALTITUDE PLANE;                   271000
COMMENT  DETECTORS;                                                     272000
COMMENT  DETERMINE INDEX, LA FOR FOR PRINTOUT ANGLES.;                  273000
JL←1;                                                                   274000
DO BEGIN                                                                275000
  IF (JCOTH2≥SVCIPA[JL]) THEN GO TO L20;                                276000
  END UNTIL (JL←(JL+1))>JNPA;                                           277000
L20: JLA←JL;                                                            278000
COMMENT  DETERMINE NUMBER OF COLLOSION PRINTOUT GROUP INDEX, LC.;       279000
JM←1;                                                                   280000
DO BEGIN                                                                281000
  IF (SVINCOL[JM]≥JNCOL) THEN GO TO L40;                                282000
  END UNTIL (JM←(JM+1))>JNPCOL;                                         283000
L40: JLC←JM;                                                            284000
COMMENT  DETERMINE NUMBER OF REFLECTION PRINTOUT GROUP INDEX, LP.;      285000
JM←1;                                                                   286000
DO BEGIN                                                                287000
  IF (JM≥JNREFL) THEN GO TO L60;                                        288000
```

```
  END UNTIL (JM←(JM+1))>JMAXR;                                          289000
L60: JLP←JM;                                                            290000
L70: JI←1;                                                              291000
DO BEGIN                                                                292000
  IF (XPR←(JH2-SVHO[JI]))=0 THEN GO TO L90;                             293000
  IF XPR<0 THEN GO TO L100;                                             294000
  END UNTIL (JI←(JI+1))>JNDMAX;                                         295000
IF (JCOTH2←JSMVAL)≥0 THEN GO TO L300 ELSE GO TO L120;                   296000
L90: JH2←JH2+JOELTA×JCOTH2;                                             297000
GO TO L70;                                                              298000
COMMENT  H2 IS BELOW OETECTOR PLANE HO(I);                              299000
L100: IF (ABS(JCOTH2)≤JSMVAL) THEN GO TO L300;                          300000
IF (XPR←(JCOTH2))>0 THEN GO TO L160;                                    301000
COMMENT  FLUX IS CALCULATEO FOR OETECTORS BELOW H2;                     302000
IF XPR=0 THEN GO TO L300 ELSE GO TO L130;                               303000
L120: JJ3←JNDMAX;                                                       304000
GO TO L150;                                                             305000
L130: IF (JI≤1) THEN GO TO L300;                                        306000
JJ3←JI-1;                                                               307000
L150: JJ1←1;                                                            308000
GO TO L170;                                                             309000
COMMENT  FLUX IS CALCULATEO FOR OETECTOR PLANES ABOVE H2;               310000
L160: JJ3←JNOMAX;                                                       311000
JJ1←JI;                                                                 312000
L170: IF JIDUMP≤0 THEN GO TO L200;                                      313000
JLOC←90;                                                                314000
  WRITE(PRINT,FL190,LIST1);                                             315000
COMMENT  CALCULATE FLUXES;                                              316000
L200: JJ2←JJ1;                                                          317000
DO BEGIN                                                                318000
  JRESULT←JWAIT×EXP((JTAUH2-SVTAUHD[JJ2])/JCOTH2)/ABS(JCOTH2);          319000
  SVFLUX[JLA,JLP,JJ2]←SVFLUX[JLA,JLP,JJ2] +JRESULT;                     320000
```

```
  SVFLUD[JNCR2,JJ2]+SVFLUD[JNCR2,JJ2]+JRESULT;                          321000
  SVAFLUX[JLC,JJ2]+SVAFLUX[JLC,JJ2]+JRESULT;                            322000
  IF JREFL≤0 THEN GO TO L220;                                           323000
  SVRFLUX[JJ2]+SVRFLUX[JJ2]+JRESULT;                                    324000
  L220: JLOC+110;                                                       325000
  IF JIDUMP≤0 THEN GO TO L250;                                          326000
WRITE(PRINT,FL240,LIST2);                                               327000
  L250: END UNTIL (JJ2+(JJ2+1))>JJ3;                                    328000
L300:  END;                                                             329000
PROCEDURE SRANSWER;                                                     330000
BEGIN                                                                   331000
   REAL ARRAY SVIIREF[0:25];                                            332000
REAL  JFGROUP,JFNHMAX;     INTEGER  JI,JJ,JK,JN,JM ;                    333000
INTEGER  DX1;                                                           334000
FORMAT FL110(" RADIATION RESEARCH ASSOCIATES *LITE* PROBLEM",I10),      335000
FL120(/" HISTORY TERMINATION COUNTERS."),                               336000
FL130(/" ",I9,                                                          337000
   " HISTORIES WERE TERMINATED WHEN THE COLLISION NUMBER EXCEEDED",I6,  338000
   "."/I10,                                                             339000
   " HISTORIES WERE TERMINATED BY THE REGION IMPORTANCE PARAMETERS."/   340000
   I10," HISTORIES WERE TERMINATED BY MINIMUM WEIGHT CUTOFF." /I10,     341000
 " HISTORIES WERE TERMINATED AFTER MAXIMUM NUMBER OF REFLECTIONS. "),   342000
    FL135 (/" ",I9,                                                     343000
       " COLLISIONS OCCURRED."),                                        344000
FL150(/                                                                 345000
   " PARTICLES TERMINATED IN EACH REGION BY REGION IMPORTANCE PARAM",   346000
   "ETERS."),                                                           347000
FL160(/                                                                 348000
   " REGION HISTORIES   REGION HISTORIES   REGION HISTORIES   REGIO",   349000
   "N HISTORIES"/                                                       350000
   "       TERMINATED         TERMINATED         TERMINATED       ",   351000
   "  TERMINATED"),                                                     352000
```

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FL170(" ",I4,I9,I10,I9,I10,I9,I10,I9),                                  353000
FL190(/                                                                 354000
   "   SCATTERED LIGHT INTENSITY VERSUS ANGLE AND NUMBER OF ",          355000
   "REFLECTIONS FROM SURFACE 1"),                                       356000
FL200("       SOURCE HEIGHT H=",E10.3,",   DETECTOR COORDINATES  HD=",  357000
   E10.3,"  RD=,",E10.1,D1),                                           358000
FL210("  ANGL ',X27,"NUMBER OF REFLECTIONS"),                           359000
FL250(" (COSINE)",I8,6(X9,I2)),                                         360000
FL262(" (COSINE)    TOTAL"),                                            361000
FL264(" ",X23,"TOTAL"),                                                 362000
FL266(" ",X34,"TOTAL"),                                                 363000
FL268(" ",X45,"TOTAL"),                                                 364000
FL270(" ",X56,"TOTAL"),                                                 365000
FL272(" ",X67,"TOTAL"),                                                 366000
FL274(" ",X78,"TOTAL"),                                                 367000
FL280(" ",R7.4,X1,7E11.4),                                              368000
FL300(/"  TOTAL  ",7E11.4),                                             369000
FL450(/                                                                 370000
   "                    SCATTERED LIGHT INTENSITY VERSUS REGION OF ",   371000
   "SCATTER"),                                                          372000
FL460(/"  REGION   ",X30,"DETECTOR"),                                   373000
FL485(/"                 01"),                                          374000
FL495(/"                 01          02"),                              375000
FL505(/"                 01          02          03"),                  376000
FL515(/"                 01          02          03          04"),      377000
FL525(/"                 01          02          03          04          05"), 378000
FL535(/                                                                 379000
   "                01          02          03          04          05  ",  380000
   "       06"),                                                        381000
FL545(/                                                                 382000
   "                01          02          03          04          05  ",  383000
   "       06          07"),                                            384000
```

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FL560("    ",I2,X3,7E11.4),                                                    385000
FL580(/"  TOTAL  ",7E11.4),                                                    386000
FL605(/"                08"),                                                  387000
FL615(/"                08          09"),                                      388000
FL625(/"                08          09          10"),                          389000
FL680(" LIGHT SCATTERED FROM REFLECTION SURFACES TO EACH DETECTOR."),          390000
FL690(/" DETECTOR",I3," REFLECTED FLUX =",E10.3)};                             391000
LIST LIST1(JNPROB)};                                                           392000
    LIST LIST14 (JNOGO)};                                                      393000
LIST LIST2(JMAXCOL,JNCMAX,JNRSTOP,JNWAIT,JNMAXR) };                            394000
LIST LIST3(FOR DX1←1 STEP 1 UNTIL JNRMAX DO (DX1,SVNRICD[DX1]))};              395000
LIST LIST4(JHS,SVHD[JJ],SVRD[JJ])};                                            396000
LIST LIST5(FOR DX1←JKA1 STEP 1 UNTIL JKA2 DO SVIIREF[DX1])};                   397000
LIST LIST6(SVCIPA[JN],FOR DX1←JKA1 STEP 1 UNTIL JKA2 DO  SVFLUX[               398000
 JN,DX1,JJ])};                                                                 399000
LIST LIST7(FOR DX1←JKA1 STEP 1 UNTIL JKA2 DO  SVTFLUX[DX1,JJ])};               400000
LIST LIST9(SVNREG[JI],FOR DX1←1 STEP 1 UNTIL JNFORM DO SVFLUD[JI,              401000
 DX1])};                                                                       402000
LIST LIST10(FOR DX1←1 STEP 1 UNTIL JNFORM DO SVFLUR[DX1])};                    403000
LIST LIST11(SVNREG[JI],FOR DX1←8 STEP 1 UNTIL JNFORM DO SVFLUD[                404000
 JI,DX1])};                                                                    405000
LIST LIST12(FOR DX1←8 STEP 1 UNTIL JNFORM DO SVFLUR[DX1])};                    406000
LIST LIST13(JI,SVRFLUX[JI])};                                                  407000
BEGIN                                                                          408000
LABEL L180,L185,L240,L261,L263,L265,L267,L269,L271,L273,L275,L430,             409000
 L440,L480,L490,L500,L510,L520,L530,L540,L550,L600,L610,L620,L650,             410000
 L670};                                                                        411000
SWITCH SWGO1←L261,L263,L265,L267,L269,L271,L273,L275};                         412000
SWITCH SWGO2←L480,L490,L500,L510,L520,L530,L540,L600,L610,L620};               413000
JFNHMAX←JNHMAX};                                                               414000
JFGROUP←JNGROUP};                                                              415000
JJ←1};                                                                         416000
```

```
DO BEGIN                                                                    417000
  JLST←JMAXR+1;                                                             418000
  JI←1;                                                                     419000
  DO BEGIN                                                                  420000
    JK←1;                                                                   421000
    DO BEGIN                                                                422000
       SVFLUX[JK,JI,JJ]← SVFLUX[JK,JI,JJ]/JFNHMAX;                          423000
       SVFLUX[JK,JLST,JJ]← SVFLUX[JK,JLST,JJ]+ SVFLUX[JK,JI,JJ];            424000
   SVTFLUX[JI,JJ]←SVTFLUX[JI,JJ]+SVFLUX[JK,JI,JJ];                          425000
      END UNTIL (JK←(JK+1))>JNPA;                                           426000
   SVTFLUX[JLST,JJ]←SVTFLUX[JLST,JJ]+SVTFLUX[JI,JJ];                        427000
  SVIIREF[JI]←JI-1;                                                         428000
    END UNTIL (JI←(JI+1))>JMAXR;                                            429000
  JM←1;                                                                     430000
  DO BEGIN                                                                  431000
    SVFLUD[JM,JJ]←SVFLUD[JM,JJ]/JFNHMAX;                                   432000
    SVFLUR[JJ]←SVFLUR[JJ]+SVFLUD[JM,JJ];                                    433000
    END UNTIL (JM←(JM+1))>JNRMAX;                                           434000
  SVRFLUX[JJ]←SVRFLUX[JJ]/JFNHMAX;                                          435000
  END UNTIL (JJ←(JJ+1))>JNDMAX;                                             436000
COMMENT  SUBROUTINE RESULT;                                                 437000
WRITE(PRINT[PAGE]);                                                         438000
WRITE(PRINT,FL110,LIST1);                                                   439000
WRITE(PRINT,FL120);                                                         440000
WRITE(PRINT,FL130,LIST2);                                                   441000
    WRITE (PRINT,FL135,LIST14);                                             442000
IF JNRSTOP≤0 THEN GO TO L180;                                               443000
WRITE(PRINT,FL150);                                                         444000
WRITE(PRINT,FL160);                                                         445000
WRITE(PRINT,FL170,LIST3);                                                   446000
L180: JJ←1;                                                                 447000
DO BEGIN                                                                    448000
```

```
JKA2←0;                                                    449000
JKA3←0;                                                    450000
L185: WRITE(PRINT[PAGE]);                                  451000
      WRITE(PRINT,FL110,LIST1);                            452000
WRITE(PRINT,FL190);                                        453000
WRITE(PRINT,FL200,LIST4);                                  454000
WRITE(PRINT,FL210);                                        455000
JKA1←JKA2+1;                                               456000
JKA2←JKA1+6;                                               457000
IF (JKA2≤JMAXR) THEN GO TO L240;                           458000
JKA3←1;                                                    459000
JKA2←JMAXR;                                                460000
IF (JKA1>JMAXR) THEN GO TO L261;                           461000
L240: WRITE(PRINT,FL250,LIST5);                            462000
IF JKA3≤0 THEN GO TO L275;                                 463000
JKA2←JKA2+1;                                               464000
JKA4←JKA2-JKA1+1;                                          465000
GO TO SWGO1[JKA4];                                         466000
L261: WRITE(PRINT,FL262);                                  467000
GO TO L275;                                                468000
L263: WRITE(PRINT,FL264);                                  469000
GO TO L275;                                                470000
L265: WRITE(PRINT,FL266);                                  471000
GO TO L275;                                                472000
L267: WRITE(PRINT,FL268);                                  473000
GO TO L275;                                                474000
L269: WRITE(PRINT,FL270);                                  475000
GO TO L275;                                                476000
L271: WRITE(PRINT,FL272);                                  477000
GO TO L275;                                                478000
L273: WRITE(PRINT,FL274);                                  479000
L275: JN←1;                                                480000
```

```
  DO BEGIN                                                          481000
    WRITE(PRINT,FL280+LIST6);                                       482000
    END UNTIL (JN+(JN+1))>JNPA;                                     483000
  WRITE(PRINT,FL300,LIST7);                                         484000
  IF JKA350 THEN GO TO L185;                                        485000
  END UNTIL (JJ+(JJ+1))>JNDMAX;                                     486000
IF (JNDMAX>7) THEN GO TO L430;                                      487000
JNFORM+JNDMAX;                                                      488000
GO TO L440;                                                         489000
L430: JNFORM+7;                                                     490000
L440: WRITE(PRINT[PAGE]);                                           491000
      WRITE(PRINT,FL110,LIST1);                                     492000
WRITE(PRINT,FL450);                                                 493000
WRITE(PRINT,FL460);                                                 494000
GO TO SWGO2[JNFORM];                                                495000
L480: WRITE(PRINT,FL485);                                           496000
GO TO L550;                                                         497000
L490: WRITE(PRINT,FL495);                                           498000
GO TO L550;                                                         499000
L500: WRITE(PRINT,FL505);                                           500000
GO TO L550;                                                         501000
L510: WRITE(PRINT,FL515);                                           502000
GO TO L550;                                                         503000
L520: WRITE(PRINT,FL525);                                           504000
GO TO L550;                                                         505000
L530: WRITE(PRINT,FL535);                                           506000
GO TO L550;                                                         507000
L540: WRITE(PRINT,FL545);                                           508000
L550: JI+1;                                                         509000
DO BEGIN                                                            510000
  WRITE(PRINT,FL560,LIST9);                                         511000
  END UNTIL (JI+(JI+1))>JNRMAX;                                     512000
```

```
WRITE(PRINT,FL580,LIST10);                                          513000
IF (JNDMAX≤JNFORM) THEN GO TO L670;                                 514000
JNFORM←JNDMAX;                                                      515000
GO TO L440;                                                         516000
L600: WRITE(PRINT,FL605);                                           517000
GO TO L650;                                                         518000
L610: WRITE(PRINT,FL615);                                           519000
GO TO L650;                                                         520000
L620: WRITE(PRINT,FL625);                                           521000
L650: JI←1;                                                         522000
DO BEGIN                                                            523000
  WRITE(PRINT,FL560,LIST11);                                        524000
  END UNTIL (JI←(JI+1))>JNRMAX;                                     525000
WRITE(PRINT,FL580,LIST12);                                          526000
L670: WRITE(PRINT[PAGE]);                                           527000
      WRITE(PRINT,FL680);                                           528000
JI←1;                                                               529000
DO BEGIN                                                            530000
  WRITE(PRINT,FL690,LIST13);                                        531000
  END UNTIL (JI←(JI+1))>JNDMAX;                                     532000
 END END;                                                           533000
PROCEDURE SRAVPAGE;                                                 534000
BEGIN                                                               535000
INTEGER  DX1,JI,JJ,JK ,JINDX ;                                      536000
REAL JFPART,JFGROUP;                                                537000
FORMAT FL110(" ",X29,"FLUXES FOR DEVIATION GROUP",I3,"."),          538000
FL120(/" COLLISIONS",X30,"DETECTOR"),                               539000
FL145(/"                01"),                                       540000
FL155(/"                01          02"),                           541000
FL165(/"                01          02          03"),               542000
FL175(/"                01          02          03          04"),   543000
FL185(/"                01          02          03          04          05"),  544000
```

```
FL195(/                                                                 545000
   "              01         02         03         04         05  ",     546000
   "       06"),                                                        547000
FL205(/                                                                 548000
   "              01         02         03         04         05  ",     549000
   "       06         07"),                                             550000
FL220("    ",I2,X3,7E11.4),                                             551000
FL230(/"  TOTAL  ",7E11.4),                                             552000
FL265(/"               08"),                                            553000
FL275(/"               08         09"),                                 554000
FL285(/"               08         09         10"),                     555000
FL320(/" BASE FOR RANDOM NUMBER GENERATOR IS",I13),                     556000
FL400 (/" ",X11,                                                        557000
   " SCATTERED INTENSITIES VERSUS DETECTOR AND COLLISION NUMBER."),     558000
 FL450 (" ",X11,                                                        559000
    " INTENSITY DEVIATIONS VERSUS DETECTOR AND COLLISION NUMBER.")};    560000
LIST LIST1(JNDEVG)};                                                    561000
LIST LIST2(SVINCOL[JI],FOR OX1←1 STEP 1 UNTIL JNFORM DO SVAFLUX[        562000
 JI,OX1])};                                                             563000
LIST LIST3(FOR OX1←1 STEP 1 UNTIL JNFORM DO SVSTFLUX[OX1])};            564000
LIST LIST4(SVINCOL[JI],FOR OX1←8 STEP 1 UNTIL JNOMAX DO SVAFLUX[        565000
 JI,OX1])};                                                             566000
LIST LIST5(FOR OX1←8 STEP 1 UNTIL JNDMAX DO SVSTFLUX[OX1])};            567000
LIST LIST6(JIBASE)};                                                    568000
LABEL L125,L130,L140,L150,L160,L170,L180,L190,L200,L210,L260,L270,       569000
 L280,L290,L310, L115, L410, L450};                                     570000
SWITCH SWG01←L140,L150,L160,L170,L180,L190,L200};                       571000
SWITCH SWG02←L260,L270,L280};                                           572000
JNOEVG←JNOEVG+1};                                                       573000
      JINDX ← 0 };                                                      574000
JFPART←JNPART};                                                         575000
      JFGROUP ← JNGROUP };                                              576000
```

```
JJ←1;                                                                  577000
DO BEGIN                                                               578000
  SVSTFLUX[JJ]←0;                                                      579000
  JI←1;                                                                580000
  DO BEGIN                                                             581000
    SVAFLUX[JI,JJ]←SVAFLUX[JI,JJ]/JFPART;                              582000
    SVSAFLUX[JI,JJ]←SVSAFLUX[JI,JJ]+SVAFLUX[JI,JJ];                    583000
    SVSQFLUX[JI,JJ]←SVSQFLUX[JI,JJ]+SVAFLUX[JI,JJ]↑2;                  584000
  SVSTFLUX[JJ]←SVSTFLUX[JJ]+SVAFLUX[JI,JJ];                            585000
    END UNTIL (JI←(JI+1))>JNPCOL;                                      586000
  SVFFLUX[JJ]←SVFFLUX[JJ]+SVSTFLUX[JJ];                                587000
  SVDVFLUX[JJ]←SVDVFLUX[JJ]+SVSTFLUX[JJ]↑2;                            588000
  END UNTIL (JJ←(JJ+1))>JNDMAX;                                        589000
WRITE(PRINT[PAGE]);                                                    590000
WRITE(PRINT,FL110,LIST1);                                              591000
L115: WRITE(PRINT,FL120);                                              592000
IF (JNDMAX>7) THEN GO TO L125;                                         593000
JNFORM←JNDMAX;                                                         594000
GO TO L130;                                                            595000
L125: JNFORM←7;                                                        596000
L130: GO TO SWGO1[JNFORM];                                             597000
L140: WRITE(PRINT,FL145);                                              598000
GO TO L210;                                                            599000
L150: WRITE(PRINT,FL155);                                              600000
GO TO L210;                                                            601000
L160: WRITE(PRINT,FL165);                                              602000
GO TO L210;                                                            603000
L170: WRITE(PRINT,FL175);                                              604000
GO TO L210;                                                            605000
L180: WRITE(PRINT,FL185);                                              606000
GO TO L210;                                                            607000
L190: WRITE(PRINT,FL195);                                              608000
```

```
GO TO L210;                                                                    609000
L200: WRITE(PRINT,FL205);                                                      610000
L210: JI+1;                                                                    611000
DO BEGIN                                                                       612000
  WRITE(PRINT,FL220,LIST2);                                                    613000
  END UNTIL (JI+(JI+1))>JNPCOL;                                                614000
WRITE(PRINT,FL230,LIST3);                                                      615000
IF (JNDMAX≤JNFORM) THEN GO TO L310;                                            616000
JNFORM+JNDMAX-JNFORM;                                                          617000
WRITE(PRINT[PAGE]);                                                            618000
WRITE(PRINT,FL110,LIST1);                                                      619000
WRITE(PRINT,FL120);                                                            620000
GO TO SWGO2[JNFORM];                                                           621000
L260: WRITE(PRINT,FL265);                                                      622000
GO TO L290;                                                                    623000
L270: WRITE(PRINT,FL275);                                                      624000
GO TO L290;                                                                    625000
L280: WRITE(PRINT,FL285);                                                      626000
L290: JI+1;                                                                    627000
DO BEGIN                                                                       628000
  WRITE(PRINT,FL220,LIST4);                                                    629000
  END UNTIL (JI+(JI+1))>JNPCOL;                                                630000
WRITE(PRINT,FL230,LIST5);                                                      631000
L310: WRITE(PRINT,FL320,LIST6);                                                632000
JJ+1;                                                                          633000
DO BEGIN                                                                       634000
  JI+1;                                                                        635000
  DO BEGIN                                                                     636000
  SVAFLUX[JI,JJ]+0;                                                            637000
    END UNTIL (JI+(JI+1))>JNPCOL END  UNTIL (JJ+(JJ+1))>JNDMAX;                638000
IF (JNHIST<JNHMAX) THEN GO TO L450;                                            639000
IF (XPR+(JINDX))>0 THEN GO TO L450;                                            640000
```

```
IF XPR<0 THEN GO TO L410;                                              641000
JINDX←-1;                                                              642000
JJ←1;                                                                  643000
DO BEGIN                                                               644000
  JI←1;                                                                645000
  DO BEGIN                                                             646000
  SVAFLUX[JI,JJ]←SVSAFLUX[JI,JJ]/JFGROUP;                              647000
    END UNTIL (JI←(JI+1))>JNPCOL;                                      648000
  SVSTFLUX[JJ]←SVFFLUX[JJ]/JFGROUP;                                    649000
  END UNTIL (JJ←(JJ+1))>JNDMAX;                                        650000
WRITE(PRINT[PAGE]);                                                    651000
WRITE(PRINT,FL400);                                                    652000
GO TO L115;                                                            653000
L410: JINDX←1;                                                         654000
JJ←1;                                                                  655000
DO BEGIN                                                               656000
  JI←1;                                                                657000
  DO BEGIN                                                             658000
    SVAFLUX [JI,JJ]←SQRT((SVSQFLUX[JI,JJ]/JFGROUP↑2)-(SVSAFLUX[        659000
     JI,JJ])↑2/(JFGROUP↑3));                                           660000
    END UNTIL (JI←(JI+1))>JNPCOL;                                      661000
       SVSTFLUX[JJ]←SQRT((SVDVFLUX[JJ]/JFGROUP↑2)-(SVFFLUX[JJ]↑2/      662000
   JFGROUP↑3));                                                        663000
  END UNTIL (JJ←(JJ+1))>JNDMAX;                                        664000
WRITE(PRINT[PAGE]);                                                    665000
WRITE(PRINT,FL450);                                                    666000
GO TO L115;                                                            667000
L450:  END;                                                            668000
PROCEDURE SRANGLE;                                                     669000
BEGIN                                                                  670000
INTEGER  JJ,JI ;                                                       671000
COMMENT  THE FOLLOWING SUBROUTINES ARE REQUIRED;                       672000
```

```
    SRRANDA;                                                                    673000
FORMAT FL15(/" NO ANGLE PROBABIL"TY COULD BE FOUND GREATER THAN",E10.3),        674000
FL34(/" INCORRECT SUBSCRIPT FOR ANGLE PROBABILITY.");                           675000
LIST LIST1(JRN);                                                                676000
LABEL L20,L35,L40,L45,L50;                                                      677000
JI←1;                                                                           678000
DO BEGIN                                                                        679000
  SRRANDA(JIBASE,JRN);                                                          680000
  JJ←1;                                                                         681000
  DO BEGIN                                                                      682000
    IF (SVPAG[JJ]≥JRN) THEN GO TO L20;                                          683000
    END UNTIL (JJ←(JJ+1))>JNAG;                                                 684000
  WRITE(PRINT,FL15,LIST1);                                                      685000
  JWHOA←JWHOA+1;                                                                686000
  GO TO L50;                                                                    687000
  L20: IF (JJ>1) THEN GO TO L35;                                                688000
  WRITE(PRINT,FL34);                                                            689000
  JWHOA←JWHOA+1;                                                                690000
  GO TO L50;                                                                    691000
  L35: SRRANDA(JIBAS1,JRN);                                                     692000
  SVSANG[JI]←SVCANG[JJ-1]-JRN×(SVCANG[JJ-1]-SVCANG[JJ]);                        693000
  IF (XPR←(JNAOP))>0 THEN GO TO L40;                                            694000
  IF XPR<0 THEN GO TO L45;                                                      695000
  JPJM1←SVPAG[JJ-1];                                                            696000
  SVWEIGHT[JI]←(1/(SVPAG[JJ]-JPJM1))×(SVCANG[JJ-1]-SVCANG[JJ])/(SVCANG[1       697000
]-SVCANG[JNAG]);                                                                698000
  GO TO L50;                                                                    699000
  L40: SVWEIGHT[JI]←SVWAG[JJ];                                                  700000
  GO TO L50;                                                                    701000
  L45: SVWEIGHT[JI]←1;                                                          702000
  L50: END UNTIL (JI←(JI+1))>JNPART;                                            703000
 END;                                                                           704000
```

```
PROCEDURE SRPATHL;                                                      705000
BEGIN                                                                   706000
  INTEGER JJ;       REAL ADJUST  ;                                      707000
COMMENT  THE FOLLOWING SUBROUTINES ARE REQUIRED:                        708000
    SRRANDA;                                                            709000
FORMAT FL130(/" LOC =",I4,"  J =",I4,"  JHB =",I4,"  JHT =",I4,"  RN =", 710000
S1,E10.3/"  RHO =",S1,E10.3,"  COTH =",S1,E10.3,"  TAUH1 =",S1,E10.3,    711000
   "  TAUH2 =",S1,E10.3/"  PL =",S1,E10.3,"  H2 =",S1,E10.3);            712000
LIST LIST1(JLOC,JJ,JJHB,JJHT,JRN,JRHO,JCOTH,JTAUH1,JTAUH2,JPL,JH2);     713000
LABEL L30,L50,L70,L100,L105,L140,L60,L110,L25;                          714000
SRRANDA(JIRAS2,JRN);                                                    715000
JLOC←25;                                                                716000
JPL←0;                                                                  717000
IF (ABS(JCOTH) ≤ JSMVAL) THEN GO TO L25 ;                               718000
IF JCOTH>0 THEN GO TO L30;                                              719000
L25 :  JRHO ← -LN(JRN) ;                                                720000
GO TO L50;                                                              721000
L30:  JUPLMIT ← (SVTAU[JNOH] - JTAUH1) / JCOTH ;                        722000
ADJUST ← 1 - EXP(-JUPLMIT) ;                                            723000
JRHO ← -LN(1 - JRN × ADJUST) ;                                          724000
JWAIT ← JWAIT × ADJUST ;                                                725000
L50: JTAUH2←JTAUH1+JRHO×JCOTH;                                          726000
IF (JTAUH2>0) THEN GO TO L60;                                           727000
JTAUH2←SVTAU[1];                                                        728000
  JH2←-JDLONG;                                                          729000
  JJHB←1;                                                               730000
JJHT←2;                                                                 731000
GO TO L105;                                                             732000
L60: JJ←1;                                                              733000
DO BEGIN                                                                734000
  IF (JTAUH2<SVTAU[JJ]) THEN GO TO L70;                                 735000
  END UNTIL (JJ←(JJ+1))>JNOH;                                           736000
```

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JH2←JDLONG;                                                          737000
JJHB←JNOH-1;                                                         738000
JJHT←JNOH;                                                           739000
GO TO L105;                                                          740000
L70: JJHB←JJ-1;                                                      741000
JJHT←JJ;                                                             742000
IF (ABS(JCOTH)>JSMVAL) THEN GO TO L100;                              743000
JH2←JH;                                                              744000
JPL←JRHO/((SVTAU[JJHT]-SVTAU[JJHB])/(SVHV[JJHT]-SVHV[JJHB]));        745000
GO TO L110;                                                          746000
L100: JH2←SVHV[JJHB]+(SVHV[JJHT]-SVHV[JJHB])×(JTAUH2-SVTAU[JJHB])/(  747000
 SVTAU[JJHT]-SVTAU[JJHB]);                                           748000
L105: JPL←(JH2-JH1)/JCOTH;                                           749000
L110: IF JIDUMP≤0 . ∠N GO TO L140;                                   750000
WRITE(PRINT,FL130,LIST1);                                            751000
L140:  END;                                                          752000
PROCEDURE SRINITAL;                                                  753000
BEGIN                                                                754000
INTEGER JJ,JI,JK,JN ;                                                755000
JJ←1;                                                                756000
DO BEGIN                                                             757000
  JLB←JNPCOL+1;                                                      758000
  JI←1;                                                              759000
  DO BEGIN                                                           760000
    SVSAFLUX[JI,JJ]←0;                                               761000
    SVSQFLUX[JI,JJ]←0;                                               762000
      SVTFLUX[   JI,JJ]←0;                                           763000
    JK←1;                                                            764000
    DO BEGIN                                                         765000
      SVFLUX[JK,JI,JJ]←0;                                            766000
      END UNTIL (JK←(JK+1))>JNPA;                                    767000
    END UNTIL (JI←(JI+1))>JLB;                                       768000
```

```
  JN←1;                                                          769000
  DO BEGIN                                                       770000
    SVFLUD[JN,JJ]←0;                                             771000
    END UNTIL (JN←(JN+1))>JNRMAX;                                772000
  SVRFLUX[JJ]←0;                                                 773000
  SVFFLUX[JJ]←0;                                                 774000
  SVDVFLUX[JJ]←0;                                                775000
  SVFLUR[JJ]←0;                                                  776000
  END UNTIL (JJ←(JJ+1))>JNDMAX;                                  777000
    JMAXCOL ← 0;                                                 778000
    JNWAIT ← 0;                                                  779000
    JNOGO ← 0;                                                   780000
    JI ← 1;                                                      781000
    DO BEGIN                                                     782000
       SVNRICO[JI] ← 0 ;                                         783000
       END UNTIL(JI←(JI+1))>JNRMAX;                              784000
 END;                                                            785000
PROCEDURE SRREFLCT;                                              786000
BEGIN                                                            787000
REAL  JDENOM;       INTEGER   JI,JJAIL;                          788000
COMMENT  THE FOLLOWING SUBROUTINES ARE REQUIRED:                 789000
    SRRANDA;                                                     790000
FORMAT FL35(/" REFLECTION ANGLE DISTRIBUTION FOR BOUNDARY",I3,   791000
   " IS IN ERROR.");                                             792000
LIST LIST1(JNRB);                                                793000
LABEL L10,L15,L20,L33,L40,L60,L70,L80,L100;                       794000
SWITCH SWGO1←L10,L20,L15,L20;                                    795000
SRRANDA(JIBAS3,JRN);                                             796000
JNRB←JNCB;                                                       797000
JJAIL←SVJREFLT[JNRB];                                            798000
GO TO SWGO1[JJAIL];                                              799000
L10: JCOTH1←JRN;                                                 800000
```

```
GO TO L70;                                                          801000
L15: JCOTH1←-JRN;                                                   802000
GO TO L70;                                                          803000
L20: JNRA←SVNRFCOS[JNRB];                                           804000
JFNRA←JNRA;                                                         805000
JI←1;                                                               806000
DO BEGIN                                                            807000
  JFI←JI;                                                           808000
  SVPRFLT[JI]←JFI/JFNRA;                                            809000
  IF (JRN≤SVPRFLT[JI]) THEN GO TO L40;                              810000
  END UNTIL (JI←(JI+1))>JNRA;                                       811000
L33: WRITE(PRINT,FL35,LIST1);                                       812000
JWHOA←JWHDA←1;                                                      813000
GO TO L100;                                                         814000
L40: IF (XPR←(JI-1))>0 THEN GO TO L60;                              815000
IF XPR<0 THEN GO TO L33;                                            816000
JCOTH1←1←(JRN/SVPRFLT[JI])×(SVRFLCOS[JI,JNRB]-1);                   817000
GO TO L70;                                                          818000
L60: JCOTH1←SVRFLCOS[JI-1,JNRB]←((JRN-SVPRFLT[JI-1])/(SVPRFLT[JI]-  819000
 SVPRFLT[JI-1]))×(SVRFLCOS[JI,JNRB]-SVRFLCOS[JI-1,JNRB]);           820000
L70: JSITH1←SQRT(1-JCOTH1←2);                                       821000
L80: SRRANDA(JIBAS4,JRN);                                           822000
JSPT←2×JRN-1;                                                       823000
SRRANDA(JIBAS5,JRN);                                                824000
JCPT←2×JRN-1;                                                       825000
JDENOM←JCPT←2←JSPT←2;                                               826000
IF (JDENOM>1) THEN GO TO L80;                                       827000
JDENOM←SQRT(JDENOM);                                                828000
JCPHI1←JCPT/JDENOM;                                                 829000
JSPHI1←JSPT/JDENOM;                                                 830000
L100:  END;                                                         831000
PROCEDURE SRSCTANG;                                                 832000
```

```
BEGIN                                                                   833000
REAL  JCDPHI, JSDPHI;   INTEGER  JI,JNPASE ;                            834000
COMMENT  THE FOLLOWING SUBROUTINES ARE REQUIRED:                        835000
    SRREFLCT, SRRANDA;                                                  836000
FORMAT FL80(/" THE PHASE ANGLE PROBABILITIES FOR MATERIAL",I3,          837000
   " ARE INCORRECT."),                                                  838000
FL139(/" LOC =",I4," NPHASE =",I4," NCM =",I4," REFL =",E10.3,          839000
   "  CSANG =",E10.3/" SSANG =",E10.3," CTEP =",E10.3," STEP =",E10.3,  840000
"  DEDM =",E10.3," CDPHI =",E10.3/" SDPHI =",E10.3," COTH2 =",E10.3,    841000
   "  SITH2 =",E10.3," SDEPHI =",E10.3/" CDEPHI =",E10.3," CPHI2 =",    842000
   E10.3," SPHI2 =",E10.3," COTH1 =",E10.3/" SITH1 =",E10.3,            843000
   "  CPHI1 =",E10.3," SPHI1 =",E10.3," RN =",E10.3);                   844000
LIST LIST1(JNCM);                                                       845000
LIST LIST2(JLOC,JNPHASE,JNCM,JREFL,JCSANG,JSSANG,JCTEP,JSTEP,JDEDM,     846000
 JCDPHI,JSDPHI,JCOTH2,JSITH2,JSDEPHI,JCDEPHI,JCPHI2,JSPHI2,JCOTH1,      847000
 JSITH1,JCPHI1,JSPHI1,JRN);                                             848000
LABEL L5,L10,L50,L90,L110,L120,L130,L137,L140;                           849000
IF JREFL<0 THEN GO TO L5;                                               850000
SRREFLCT;                                                               851000
GO TO L137;                                                             852000
L5: SRRANDA(JIBASE,JRN);                                                853000
IF (JRN> JRATLEE)        THEN GO TO L50;                                854000
L10: SRRANDA(JIBAS1,JRN);                                               855000
JCSANG←1-2×JRN;                                                         856000
SRRANDA(JIBAS2,JRN);                                                    857000
IF (JRN≤.5) THEN GO TO L120;                                            858000
SRRANDA(JIBAS3,JRN);                                                    859000
IF (JRN>JCSANG×JCSANG) THEN GO TO L10 ELSE GO TO L120;                  860000
L50: SRRANDA(JIBAS4,JRN);                                               861000
JNPASE←SVNPHANG[JNCM];                                                  862000
JFNPA←JNPASE;                                                           863000
JI←1;                                                                   864000
```

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OO BEGIN                                                                    865000
  JFI←JI;                                                                   866000
  SVPFANG[JI]←JFI/JFNPA;                                                    867000
  IF (JRN≤SVPFANG[JI]) THEN GO TO L90;                                      868000
  END UNTIL (JI←(JI+1))>JNPASE;                                             869000
WRITE(PRINT,FL8C,LIST1);                                                    870000
JWHOA←JWHOA+1;                                                              871000
GO TO L140;                                                                 872000
L90: IF (JFI>1) THEN GO TO L110;                                            873000
JCSANG←1+(JRN/SVPFANG[JI])×(SVPHANG[JI,JNCM]-1);                            874000
GO TO L120;                                                                 875000
L110: JCSANG←SVPHANG[JI-1,JNCM]+((JRN-SVPFANG[JI-1])/(SVPFANG[JI]-          876000
 SVPFANG[JI-1]))×(SVPHANG[JI,JNCM]-SVPHANG[JI-1,JNCM]);                     877000
L120: JSSANG←SQRT(1-JCSANG×JCSANG);                                         878000
L130: SRRANOA(JIBASS,JRN);                                                  879000
JCTEP←1-2×JRN;                                                              880000
SRRANDA(JIBASE,JRN);                                                        881000
JSTEP←1-2×JRN;                                                              882000
JDEOM←JCTEP↑2+JSTEP↑2;                                                      883000
IF (JDEOM>1) THEN GO TO L130;                                               884000
JDEOM←SQRT(JDEOM);                                                          885000
JCOPHI←JCTEP/JDEOM;                                                         886000
JSOPHI←JSTEP/JDEOM;                                                         887000
 IF JSITH2 < JSMVAL THEN BEGIN JCOTH1 ← JCSANG×JCOTH2                       888000
 JSITH1 ← JSSANG;                                                           889000
JCPHI1 ← JCOPHI;                                                            890000
 JSPHI1 ← JSOPHI;                                                           891000
 END ELSE BEGIN                                                             892000
JCOTH1←JCOTH2×JCSANG+JSITH2×JSSANG×JCOPHI;                                  893000
JSITH1←SQRT(1-JCOTH1×JCOTH1);                                               894000
JSOEPHI←(JSSANG×JSOPHI)/JSITH1;                                             895000
JCOEPHI←(JCSANG-JCOTH1×JCOTH2)/(JSITH1×JSITH2);                             896000
```

```
JCPHI1*JCPHI2*JCDEPHI-JSPHI2*JSDEPHI;                                   897000
JSPHI1*JSPHI2*JCDEPHI+JCPHI2*JSDEPHI;                                   898000
 END;                                                                   899000
L137: JCOTH2*JCOTH1;                                                    900000
JSITH2*JSITH1;                                                          901000
JCPHI2*JCPHI1;                                                          902000
JSPHI2*JSPHI1;                                                          903000
JLOC*80;                                                                904000
IF JIDUMP≤0 THEN GO TO L140;                                            905000
WRITE(PRINT,FL139,LIST2);                                               906000
L140:  END;                                                             907000
PROCEDURE SRDBEAM;                                                      908000
BEGIN                                                                   909000
INTEGER JJ, JJ2;  REAL   JVD;                                           910000
COMMENT  THE FOLLOWING SUBROUTINES ARE REQUIRED:                        911000
    SRDSTBD, SRSEARCH;                                                  912000
FORMAT FL11(" HS IS GREATER THAN HV(NOH).                      "),      913000
       FL230(" RADIATION RESEARCH ASSOCIATES -LITE- PROBLEM",I10),      914000
FL240(/" DIRECT BEAM LIGHT INTENSITIES"//                               915000
   "  DETECTOR   DIRECT INTENSITY"),                                    916000
FL250(/" ",I6,X8,E11.4);                                                917000
LIST LIST1(JNPROB);                                                     918000
LIST LIST2(JJ,SVDBFLUX[JJ]);                                            919000
LABEL L3,L100,L210,L300,L280;                                           920000
JJ2*2;                                                                  921000
DO BEGIN                                                                922000
  IF (JHS≤SVHV[JJ2]) THEN GO TO L3;                                     923000
  END UNTIL (JJ2*(JJ2+1))>JNOH;                                         924000
WRITE(PRINT,FL11);                                                      925000
GO TO L300;                                                             926000
L3: JJHB*JJ2-1;                                                         927000
JJHT*JJ2;                                                               928000
```

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JJ+1;                                                                  929000
DO BEGIN                                                               930000
  JVD+SVHD[JJ]-JHS;                                                    931000
  JT+SQRT(JVD+2+SVRD[JJ]+2);                                           932000
  JCOTH+JVD/JT;                                                        933000
  IF (ABS(JCOTH)>JSMVAL) THEN GO TO L100;                              934000
      JRHOT+JT*(SVTAU[JJHT]-SVTAU[JJHB])/(SVHV[JJHT]-SVHV[JJHB]);      935000
      GO TO L210;                                                      936000
      L100: JRHOT + (SVTAUHD[JJ]-JTAUH )/JCOTH;                        937000
  L210: SVDBFLUX[JJ]+SVDBSS[JJ]*EXP(-JRHOT)/JT+2;                      938000
  END UNTIL (JJ+(JJ+1))>JNDMAX;                                        939000
WRITE(PRINT[PAGE]);                                                    940000
WRITE(PRINT,FL230,LIST1);                                              941000
WRITE(PRINT,FL240);                                                    942000
JJ+1;                                                                  943000
DO BEGIN                                                               944000
  WRITE(PRINT,FL250,LIST2);                                            945000
  END UNTIL (JJ+(JJ+1))>JNDMAX;                                        946000
WRITE(PRINT[PAGE]);                                                    947000
L280: JWHOA+JWHOA+1;                                                   948000
L300:  END;                                                            949000
PROCEDURE SRCHECK;                                                     950000
BEGIN                                                                  951000
INTEGER   JI1,JINAG,JINPA,JINPCOL,JINRF1,JINRF2,JINRF,JJCHECH,JJCHECK, 952000
        JJ,JNRF1,JNRF2,JNRF3,JNRF,JNAG1,JNPA1,JNPCOL1 ;                953000
FORMAT FL25("  THE NUMBER OF REFLECTION BOUNDRIES",I3,                 954000
   " EXCEEDS THE LIMIT OF 5 ALLOWED",".DATA CHECK CONTINUES...");      955000
FL45("  THE NUMBER OF DETECTORS",I3," EXCEEDS THE LIMIT OF 10 ALLOWED", 956000
   ".DATA CHECK CONTINUES...");                                        957000
FL65("  THE NUMBER OF MATERIALS",I3," EXCEEDS THE LIMIT OF 10 ALLOWED", 958000
   ".DATA CHECK CONTINUES...");                                        959000
FL85("  THE NUMBER OF PRINT COLLISIONS",I3,                            960000
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   " EXCEEDS THE LIMIT OF 24 ALLOWED",".DATA CHECK CONTINUES..."),          961000
FL105(" THE NUMBER OF PRINT ANGLES",I3,                                     962000
   " EXCEEDS THE LIMIT OF 25 ALLOWED",".DATA CHECK CONTINUES..."),          963000
FL125(" THE NUMBER OF SOURCE ANGLES",I3,                                    964000
   " EXCEEDS THE LIMIT OF 37 ALLOWED",".DATA CHECK CONTINUES..."),          965000
FL145(" THE NUMBER OF REGIONS",I4," EXCEEDS THE LIMIT OF  50 ALLOWED",     966000
   ".DATA CHECK CONTINUES..."),                                             967000
FL165(" THE NUMBER OF BOUNDRIES",I4,                                        968000
   " EXCEEDS THE LIMIT OF  50 ALLOWED",".DATA CHECK CONTINUES..."),         969000
FL180(" COSINE SOURCE ANGLES MUST BE INPUT IN DESCENDING ORDER",            970000
   ".DATA CHECK CONTINUES..."),                                             971000
FL215(" COSINE PRINT ANGLES MUST BE INPUT IN DESCENDING ORDER",             972000
   ".DATA CHECK CONTINUES..."),                                             973000
FL235(" REFLECTION ANGLES MUST BE INPUT IN DESCENDING ORDER",               974000
   ".DATA CHECK CONTINUES..."),                                             975000
FL270(" REFLECTION COSINES MUST BE INPUT IN DESCENDING ORDER",              976000
   ".DATA CHECK CONTINUES..."),                                             977000
FL315(" DIFFERENTIAL COSINES MUST BE INPUT IN DESCENDING ORDER",            978000
   ".DATA CHECK CONTINUES..."),                                             979000
FL355(" PHASE ANGLES MUST BE INPUT IN DESCENDING ORDER",                    980000
   ".DATA CHECK CONTINUES..."),                                             981000
FL385(" ANGLE PROBABILITIES MUST BE INPUT IN ASCENDING ORDER",              982000
   ".DATA CHECK CONTINUES..."),                                             983000
FL415(" INPUT NUMBER OF COLLISSION MUST BE IN ASCENDING ORDER",             984000
   ".DATA CHECK CONTINUES..."),                                             985000
FL435(" "," THERE ARE A TOTAL OF",I5," INPUT DATA ERRORS"///                986000
   "TAKE PROBLEM OFF COMPUTER AND CORRECT ERRORS. BETTER LUCK NEXT ",       987000
   "TIME"),                                                                 988000
FL455(" INPUT DATA SEEMS TO BE ALLRIGHT. EXECUTION CONTINUES.")$            989000
LIST LIST1(JNRFLB)$                                                         990000
LIST LIST2(JNDMAX)$                                                         991000
LIST LIST3(JNMAT)$                                                          992000
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LIST LIST4(JNPCOL)$                                                    993000
LIST LIST5(JNPA)$                                                      994000
LIST LIST6(JNAG)$                                                      995000
LIST LIST7(JNRMAX)$                                                    996000
LIST LIST8(JNBMAX)$                                                    997000
LIST LIST9(JJCHECK)$                                                   998000
LABEL L30,L50,L70,L90,L110,L130,L150,L170,L200,L220,L240,L280,L300,     999000
 L320,L360,L370,L390,L420,L450$                                       1000000
JJCHECK←0$                                                            1001000
IF (JNRFLB≤5) THEN GO TO L30$                                         1002000
WRITE(PRINT,FL25,LIST1)$                                              1003000
JJCHECK←JJCHECK+1$                                                    1004000
L30: IF (JNDMAX≤10) THEN GO TO L50$                                   1005000
WRITE(PRINT,FL45,LIST2)$                                              1006000
JJCHECK←JJCHECK+1$                                                    1007000
L50: IF (JNMAT≤10) THEN GO TO L70$                                    1008000
WRITE(PRINT,FL65,LIST3)$                                              1009000
JJCHECK←JJCHECK+1$                                                    1010000
L70: IF (JNPCOL≤24) THEN GO TO L90$                                   1011000
WRITE(PRINT,FL85,LIST4)$                                              1012000
JJCHECK←JJCHECK+1$                                                    1013000
L90: IF (JNPA≤25) THEN GO TO L110$                                    1014000
WRITE(PRINT,FL105,LIST5)$                                             1015000
JJCHECK←JJCHECK+1$                                                    1016000
L110: IF (JNAG≤37) THEN GO TO L130$                                   1017000
WRITE(PRINT,FL125,LIST6)$                                             1018000
JJCHECK←JJCHECK+1$                                                    1019000
L130: IF (JNRMAX≤50) THEN GO TO L150$                                 1020000
WRITE(PRINT,FL145,LIST7)$                                             1021000
JJCHECK←JJCHECK+1$                                                    1022000
L150: IF (JNBMAX≤50) THEN GO TO L170$                                 1023000
WRITE(PRINT,FL165,LIST8)$                                             1024000
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JJCHECK←JJCHECK+1;                                                    1025000
JNAG1←JNAG-1;                                                         1026000
L170: JJ←1;                                                           1027000
DO BEGIN                                                              1028000
  IF (SVCANG[JJ]≥SVCANG[JJ+1]) THEN GO TO L200;                       1029000
  WRITE(PRINT,FL180);                                                 1030000
  JJCHECK←JJCHECK+1;                                                  1031000
  L200: END UNTIL (JJ←(JJ+1))>JNAG1;                                  1032000
JNPA1←JNPA-1;                                                         1033000
JJ←1;                                                                 1034000
DO BEGIN                                                              1035000
  IF (SVCIPA[JJ]≥SVCIPA[JJ+1]) THEN GO TO L220;                       1036000
  WRITE(PRINT,FL215);                                                 1037000
  JJCHECK←JJCHECK+1;                                                  1038000
  L220: END UNTIL (JJ←(JJ+1))>JNPA1;                                  1039000
IF JNRFLB≤0 THEN GO TO L300;                                          1040000
JI1←1;                                                                1041000
DO BEGIN                                                              1042000
  JNRF←SVNRFANG[JI1]-1;                                               1043000
  JJ←1;                                                               1044000
  DO BEGIN                                                            1045000
    IF (SVRFANG[JJ,JI1]≥SVRFANG[JJ+1,JI1]) THEN GO TO L240;           1046000
    WRITE(PRINT,FL235);                                               1047000
    JJCHECK←JJCHECK+1;                                                1048000
    L240: END UNTIL (JJ←(JJ+1))>JNRF;                                 1049000
  END UNTIL (JI1←(JI1+1))>JNRFLB;                                     1050000
JI1←1;                                                                1051000
DO BEGIN                                                              1052000
  JNRF1←SVNRFCOS[JI1]-1;                                              1053000
  JJ←1;                                                               1054000
  DO BEGIN                                                            1055000
    IF (SVRFLCOS[JJ,JI1]≥SVRFLCOS[JJ+1,JI1]) THEN GO TO L280;         1056000
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    WRITE(PRINT,FL270);                                              1057000
    JJCHECK←JJCHECK+1;                                               1058000
    L280: END UNTIL (JJ←(JJ+1))>JNRF1;                               1059000
  END UNTIL (JI1←(JI1+1))>JNRFLB;                                    1060000
L300: JI1←1;                                                         1061000
DO BEGIN                                                             1062000
  IF (SVRAYLEE[JI1]=1) THEN GO TO L370;                              1063000
  JNRF2←SVNDFCOS[JI1]-1;                                             1064000
  JJ←1;                                                              1065000
  DO BEGIN                                                           1066000
    IF (SVDIFCOS[JJ,JI1]≥SVDIFCOS[JJ+1,JI1]) THEN GO TO L320;        1067000
    WRITE(PRINT,FL315);                                              1068000
    JJCHECK←JJCHECK+1;                                               1069000
    L320: END UNTIL (JJ←(JJ+1))>JNRF2;                               1070000
  JNRF3←SVNPHANG[JI1]-1;                                             1071000
  JJ←1;                                                              1072000
  DO BEGIN                                                           1073000
    IF (SVPHANG[JJ,JI1]≥SVPHANG[JJ+1,JI1]) THEN GO TO L360;          1074000
    WRITE(PRINT,FL355);                                              1075000
    JJCHECK←JJCHECK+1;                                               1076000
    L360: END UNTIL (JJ←(JJ+1))>JNRF3;                               1077000
  L370: END UNTIL (JI1←(JI1+1))>JNMAT;                               1078000
JNAG1←JNAG-1;                                                        1079000
JJ←1;                                                                1080000
DO BEGIN                                                             1081000
  IF (SVPAG[JJ]≤SVPAG[JJ+1]) THEN GO TO L390;                        1082000
  WRITE(PRINT,FL385);                                                1083000
  JJCHECK←JJCHECH+1;                                                 1084000
  L390: END UNTIL (JJ←(JJ+1))>JNAG1;                                 1085000
JNPCOL1←JNPCOL-1;                                                    1086000
JJ←1;                                                                1087000
DO BEGIN                                                             1088000
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  IF (SVINCOL[JJ]≤SVINCOL[JJ+1]) THEN GO TO L420;                    1089000
  WRITE(PRINT,FL415);                                                1090000
  JJCHECK←JJCHECK+1;                                                 1091000
  L420: END UNTIL (JJ←(JJ+1))>JNPCOL1;                               1092000
IF JJCHECK≤0 THEN GO TO L450;                                        1093000
WRITE(PRINT[PAGE]);                                                  1094000
WRITE(PRINT,FL435,LIST9);                                            1095000
ERROR(0);                                                            1096000
L450: WRITE(PRINT,FL455);                                            1097000
 END;                                                                1098000
PROCEDURE SRMAIN;                                                    1099000
BEGIN                                                                1100000
INTEGER JJ2, JJAIL;                                                  1101000
REAL JCRATIO, JFRACT;                                                1102000
COMMENT  THE FOLLOWING SUBROUTINES ARE REQUIRED:                     1103000
    SRINITAL, SRSEARCH, SRAVRAGE, SRANSWER, SRANGLE, SRPATHL, SRDSTBD,  1104000
   SRRANDA, SRSCTANG, SRDETECT;                                      1105000
FORMAT FL11(" HS IS GREATER THAN HV(NOM).                    "),     1106000
FL6(/" CANNOT LOCATE REGION CONTAINING SOURCE PARTICLE."),           1107000
FL76(/" LOC =",I4," NPART =",I4," NSP =",I4," NHIST =",I6," NCR =",  1108000
   I4," NCOL =",I4/" H1 =",S1,E10.3," R1 =",S1,E10.3," COTH1 =",S1,  1109000
   E10.3," SITH1 =",S1,E10.3/" CPHI1 =",S1,E10.3," SPHI1 =",S1,E10.3,  1110000
   " WAIT =",S1,E10.3).                                              1111000
FL96(/" LOC =",I4," NCR =",I4," NCM =",I3," R =",S1,E10.3," H =",S1,  1112000
E10.3/" COTH =",S1,E10.3," SITH =",S1,E10.3," CIPH =",S1,E10.3,      1113000
   " SPHI =",S1,E10.3),                                              1114000
FL106(/" A NEGATIVE OR ZERO PATH LENGTH WAS GENERATED, PL=",S1,E10.3),  1115000
FL136(/" PROGRAM FAILED TO CALCULATE DISTANCE TO A BOUNDARY."),      1116000
FL142(/" LOC =",I4," NCR =",I4," NCB =",I4," T =",S1,E10.3,          1117000
   " SUMOST =",S1,E10.3/" DIST =",S1,E10.3," RHOT =",S1,E10.3,       1118000
   " DT =",S1,F10.3," HT =",S1,F10.3/" RHO =",S1,F10.3," NCM =",I4,  1119000
   " NLM =",I4),                                                     1120000
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FL147(/" LOC =",I4," NCM =",I4," NLM =",I4," H =",S1,E10.3," TS =",  1121000
   S1,E10.3/" RT =",S1,E10.3," CPHI =",S1,E10.3," R =",S1,E10.3),     1122000
FL177(/" CANNOT FIND REGION CONTAINING PARTICLE COORDINATES, H=",S1,  1123000
   E10.3," R=",S1,E10.3),                                            1124000
FL264(/" LOC =",I4," NCR1 =",I4," NCR2 =",I4," DIST =",S1,E10.3,     1125000
   " DT =",S1,E10.3/" T =",S1,E10.3," SUMOST =",S1,E10.3," H2 =",S1, 1126000
   E10.3," TS =",S1,E10.3/" RT =",S1,E10.3," CPHI2 =",S1,E10.2,      1127000
   " R2 =",S1,E10.3," SPHI2 =",S1,E10.3/" COTH2 =",S1,E10.3,         1128000
   " SITH2 =",S1,E10.3," NCOL =",I4);                                1129000
LIST LIST1(JLOC,JNPART,JNSP,JNHIST,JNCR,JNCOL,JH1,JR1,JCOTH1,JSITH1, 1130000
 JCPHI1,JSPHI1,JWAIT);                                               1131000
LIST LIST2(JLOC,JNCR,JNCM,JR,JH,JCOTH,JSITH,JCPHI,JSPHI);           1132000
LIST LIST3(JPL);                                                     1133000
LIST LIST4(JLOC,JNCR,JNCB,JT,JSUMOST,JDIST,JRHOT,JDT,JHT,JRHO,JNCM,JNLM) 1134000
 ;                                                                   1135000
LIST LIST5(JLOC,JNCM,JNLM,JH,JTS,JRT,JCPHI,JR);                     1136000
LIST LIST6(JH,JR);                                                   1137000
LIST LIST7(JLOC,JNCR1,JNCR2,JDIST,JDT,JT,JSUMOST,JH2,JTS,JRT,JCPHI2,JR2, 1138000
 JSPHI2,JCOTH2,JSITH2,JNCOL);                                        1139000
BEGIN                                                                1140000
LABEL L3,L2,L8,L7,L10,L60,L70,L80,L100,L110,L130,L140,L144,L150,L1600, 1141000
 L161,L165,L166,L170,L180,L310,L188,L250,L260,L269,L320,L340,L350;    1142000
SWITCH SWGO1←L165,L165,L161,L161;                                    1143000
JNPART←JNHMAX DIV JNGROUP;                                           1144000
JNSP←JNPART+1;                                                       1145000
JNHIST←0;                                                            1146000
JNDEVG←0;                                                            1147000
SRINITAL;                                                            1148000
JMPREG←JNSOREG;                                                      1149000
JWHOA←0;                                                             1150000
JH←JHS;                                                              1151000
JJ2←2;                                                               1152000
```

```
DO BEGIN                                                                1153000
  IF (XPR←(JHS-SVHV[JJ2]))=0 THEN GO TO L2;                             1154000
  IF XPR<0 THEN GO TO L3;                                               1155000
  END UNTIL (JJ2←(JJ2+1))>JNOH;                                         1156000
WRITE(PRINT,FL11);                                                      1157000
GO TO L350;                                                             1158000
L3: JTAUH←SVTAU[JJ2-1]+(SVTAU[JJ2]-SVTAU[JJ2-1])×(JHS-SVHV[JJ2-1])/(   1159000
 SVHV[JJ2]-SVHV[JJ2-1]);                                                1160000
GO TO L8;                                                               1161000
L2: JTAUH←SVTAU[JJ2];                                                   1162000
L8: JERRORS←JWHOA;                                                      1163000
SRSEARCH;                                                               1164000
IF (JERRORS<JWHOA) THEN GO TO L340;                                     1165000
IF (JNCR=JNSOREG) THEN GO TO L7;                                        1166000
WRITE(PRINT,FL6);                                                       1167000
GO TO L350;                                                             1168000
L7: JREFL←0;                                                            1169000
L10: IF (XPR←(JNPART-JNSP))>0 THEN GO TO L70;                           1170000
IF XPR<0 THEN GO TO L60;                                                1171000
SRAVRAGE;                                                               1172000
IF (JNHIST<JNHMAX) THEN GO TO L60;                                      1173000
SRANSWER;                                                               1174000
GO TO L350;                                                             1175000
L60: SRANGLE;                                                           1176000
IF (JERRORS<JWHOA) THEN GO TO L340;                                     1177000
JNSP←0;                                                                 1178000
L70: JNHIST←JNHIST+1;                                                   1179000
JNREFL←1;                                                               1180000
JLOC←10;                                                                1181000
JNSP←JNSP+1;                                                            1182000
JTAUH2←JTAUH;                                                           1183000
JH1←JHS;                                                                1184000
```

```
JNCR←JNSOREG;                                                    1185000
JCOTH1←SVSANG[JNSP];                                             1186000
JSITH1←SQRT(1-JCOTH1×JCOTH1);                                    1187000
JWAIT←SVWEIGHT[JNSP];                                            1188000
JNCOL←1;                                                         1189000
IF JIDUMP≤0 THEN GO TO L80;                                      1190000
WRITE(PRINT,FL76,LIST1);                                         1191000
L80: JLOC←20;                                                    1192000
JH←JH1;                                                          1193000
JREFL←0;                                                         1194000
JTAUH1←JTAUH2;                                                   1195000
JCOTH←JCOTH1;                                                    1196000
JSITH←JSITH1;                                                    1197000
JNCR1←JNCR;                                                      1198000
JNCM←SVMAT[JNCR];                                                1199000
IF JIDUMP≤0 THEN GO TO L100;                                     1200000
WRITE(PRINT,FL96,LIST2);                                         1201000
L100: SRPATHL;                                                   1202000
IF (JERRORS<JWHOA) THEN GO TO L340;                              1203000
IF JPL>0 THEN GO TO L110;                                        1204000
WRITE(PRINT,FL106,LIST3);                                        1205000
JWHOA←JWHOA+1;                                                   1206000
GO TO L340;                                                      1207000
L110: JT←JPL;                                                    1208000
JRHOT←0;                                                         1209000
JDT←0;                                                           1210000
JSUMDST←0;                                                       1211000
JHT←JH;                                                          1212000
L130: SRDSTBD;                                                   1213000
IF (JERRORS<JWHOA) THEN GO TO L340;                              1214000
IF JNCB≥0 THEN GO TO L140;                                       1215000
WRITE(PRINT,FL136);                                              1216000
```

```
GO TO L350;                                                    1217000
L140: JSUMDST←JSUMDST+JDIST;                                   1218000
JLOC←50;                                                       1219000
IF JIDUMP≤0 THEN GO TO L144;                                   1220000
WRITE(PRINT,FL142,LIST4);                                      1221000
L144: IF (JSUMDST≥JT) THEN GO TO L250;                         1222000
JNCM←SVMAT[JNCR];                                              1223000
JH←JH+JCOTH×JDIST;                                             1224000
JTS←JDIST×JSITH;                                               1225000
JNLM←JNCM;                                                     1226000
JLOC←60;                                                       1227000
IF JIDUMP≤0 THEN GO TO L150;                                   1228000
WRITE(PRINT,FL147,LIST5);                                      1229000
L150: IF (SVNBOUND[JNCB])≥0 THEN GO TO L170;                   1230000
JH2←JH-2×JDELTA×JCOTH;                                         1231000
IF (JNCB≠1) THEN GO TO L1600;                                  1232000
JNREFL←JNREFL+1;                                               1233000
IF (JNREFL - JMAXR ≤ 1) THEN GO TO L1600 ;                     1234000
JNMAXR ← JNMAXR + 1 ;                                          1235000
GO TO L10 ;                                                    1236000
L1600: JREFL←1;                                                1237000
JNRB←JNCB;                                                     1238000
JJAIL←SVJREFLT[JNRB];                                          1239000
GO TO SWGO1[JJAIL];                                            1240000
L161: JCOTH2←-1;                                               1241000
GO TO L166;                                                    1242000
L165: JCOTH2←1;                                                1243000
L166: JSITH2←0;                                                1244000
JWAIT←JWAIT×SVALBEDO[JNCB];                                    1245000
GO TO L260;                                                    1246000
L170: JMPREG←SVMPR[JJ1,JNCR];                                  1247000
SRSEARCH;                                                      1248000
```

```
IF (JERRORS<JWHOA) THEN GO TO L340;                                    1249000
IF JNCR>0 THEN GO TO L180;                                             1250000
WRITE(PRINT,FL177,LIST6);                                              1251000
GO TO L350;                                                            1252000
L180: JNCR2←JNCR;                                                      1253000
IF (SVEMP[JNCR2]≥SVEMP[JNCR1]) THEN GO TO L188;                        1254000
SRRANDA(JIBASE,JRN);                                                   1255000
IF (JRN>(SVEMP[JNCR2]/SVEMP[JNCR1])) THEN GO TO L310;                  1256000
JWAIT←JWAIT×(SVEMP[JNCR1]/SVEMP[JNCR2]);                               1257000
GO TO L188;                                                            1258000
L310: SVNRICO[JNCR2]←SVNRICO[JNCR2]+1;                                 1259000
JNRSTOP←JNRSTOP+1;                                                     1260000
GO TO L10;                                                             1261000
L188: JDT←JDT+JDIST;                                                   1262000
JNCM←SVMAT[JNCR];                                                      1263000
GO TO L130;                                                            1264000
L250: JDIST←JT-JDT;                                                    1265000
JH2←JH+JCOTH×JDIST;                                                    1266000
JTS←JDIST×JSITH;                                                       1267000
JCOTH2←JCOTH;                                                          1268000
JSITH2←JSITH;                                                          1269000
JFRACT←(JH2-SVHV[JJHB])/(SVHV[JJHT]-SVHV[JJHB]);                       1270000
JCRATIO←SVSCATR[JJHB]+(SVSCATR[JJHT]-SVSCATR[JJHB])×JFRACT;            1271000
JRATLEE←SVRAYR[JJHB]+(SVRAYR[JJHT]-SVRAYR[JJHB])×JFRACT;               1272000
JWAIT←JWAIT×JCRATIO;                                                   1273000
L260: JNCR2←JNCR;                                                      1274000
JLOC←70;                                                               1275000
SRSCTANG;                                                              1276000
IF (JERRORS<JWHOA) THEN GO TO L340;                                    1277000
SRDETECT;                                                              1278000
IF (JERRORS<JWHOA) THEN GO TO L340;                                    1279000
IF JIDUMP≤0 THEN GO TO L269;                                           1280000
```

```
WRITE(PRINT,FL264,LIST7);                                          1281000
L269: JNCOL←JNCOL+1;                                               1282000
IF (JNCOL≤JNCMAX) THEN GO TO L320;                                 1283000
JMAXCOL←JMAXCOL+1;                                                 1284000
JNOGO←JNOGO+1;                                                     1285000
GO TO L10;                                                         1286000
L320: JNOGO←JNOGO+1;                                               1287000
JH1←JH2;                                                           1288000
JNCR←JNCR2;                                                        1289000
IF (JWAIT>JWCO) THEN GO TO L80;                                    1290000
JNWAIT←JNWAIT+1;                                                   1291000
GO TO L10;                                                         1292000
L340: IF (JWHOA>JELIM) THEN GO TO L350;                            1293000
JERRORS←JWHOA;                                                     1294000
GO TO L10;                                                         1295000
L350:  END END;                                                    1296000
PROCEDURE MAINPRO;                                                 1297000
BEGIN                                                              1298000
INTEGER JI1,JI2,JI3,JI4,JICHECK,JJAIL,JLIS1,JLIS2,I,J;             1299000
INTEGER  DX1,DX2;                                                  1300000
COMMENT  THE FOLLOWING SUBPOUTINES ARE REQUIRED:                   1301000
    SRCHECK, SRMAIN, SRDBEAM;                                      1302000
FORMAT FL10(5I10),                                                 1303000
FL110(2i10,4R10.4),                                                1304000
FL130(6R10.4),                                                     1305000
FL170(4R10.4),                                                     1306000
FL210(2I10,R10.4),                                                 1307000
FL230(3I5,R5.2,8I5),                                               1308000
FL310(2R10.4,I10,R10.4),                                           1309000
FL330(/" SVHD[J] IS GREATER THAN SVHV[JNOH] FOR J =",I4,           1310000
 ".",                                                              1311000
FL350 (/"I=",I4,"J=",I4,"TAUHD[I]=",S1,E10.3),                     1312000
```

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FL410(6I10),                                                          1313000
FL510(R10.4),                                                         1314000
FL810(6I10),                                                          1315000
FL905(/                                                               1316000
   " THE NUMBER OF HISTORIES WAS NOT EQUALLY DIVISIBLE BY  THE NUMB",  1317000
   "ER OF DEVIATION GROUPS."/"  THE NUMBER OF HISTORIES WAS  RESET TO",  1318000
   I6),                                                               1319000
FL920(/" INPUT NUMBER OF MATERIALS DOES NOT AGREE WITH NMAT. "),      1320000
FL950(/" INPUT NUMBER OF BOUNDARIES DOES NOT AGREE WITH NBMAX."),     1321000
FL980(/" INPUT NUMBER OF REGIONS DOES NOT AGREE WITH NRMAX."),        1322000
FL1010(/" INPUT NUMBER OF DETECTORS DOES NOT AGREE WITH NDMAX."),     1323000
FL1040(/" INPUT NUMBER OF PRINT COLLISIONS DOES NOT AGREE WITH NPCOL."), 1324000
FL1070(/" INPUT NUMBER OF PRINT COSINES DOES NOT AGREE WITH NPA."),   1325000
FL2000(/                                                              1326000
   " INPUT NUMBER OF REFLECTION BOUNDARIES DOES NOT AGREE WITH NRFL",  1327000
   "B."),                                                             1328000
FL2030(/" INPUT SOURCE ANGLE OPTION DOES NOT AGREE WITH NADP."),      1329000
FL2060(/" INPUT NUMBER OF SOURCE ANGLES DOES NOT AGREE WITH NAG."));  1330000
LIST LIST1(JLIBRAY,JI1,JI2,JI3,JI4);                                  1331000
LIST LIST21 (FOR DX1=1 STEP 1 UNTIL JNOH DO (SVHV[DX1],SVTAU[DX1],    1332000
 SVSCATR[DX1],  SVRAYR[DX1]));                                        1333000
LIST LIST2(SVNOFCOS[JI1],SVNPHANG[JI1],SVSIGNOT[JI1],SVRAYLEE[JI1],SVA[ 1334000
 JI1],SVCRATIO[JI1]);                                                 1335000
LIST LIST3(FOR DX1=1 STEP 1 UNTIL JLIS1 DO SVDIFCOS[DX1,JI1]);        1336000
LIST LIST4(FOR DX1=1 STEP 1 UNTIL JLIS1 DO SVPDCOS[DX1,JI1]);         1337000
LIST LIST5(FOR DX1=1 STEP 1 UNTIL JLIS2 DO SVPHANG[DX1,JI1]);         1338000
LIST LIST6(FOR DX1=1 STEP 1 UNTIL JI1 DO (SVNBOUND[DX1],SVITYPE[      1339000
 DX1],SVCOEE[DX1]));                                                  1340000
LIST LIST7(FOR DX1=1 STEP 1 UNTIL JI2 DO (SVNREG[DX1],SVNB[DX1],SVMAT[ 1341000
 DX1],SVEMP[DX1],FOR DX2=1 STEP 1 UNTIL 4 DO (SVIB[DX2,DX1],SVMPR[    1342000
 DX2,DX1]))));                                                        1343000
LIST LIST8(FOR DX1=1 STEP 1 UNTIL JI1 DO (SVHD[DX1],SVRD[DX1],SVNPHID[ 1344000
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 DX1],SVDBSS[DX1]])};                                                    1345000
LIST LIST9(FOR DX1←1 STEP 1 UNTIL JI1 DO SVINCDL[DX1])};                 1346000
LIST LIST10(FOR DX1←1 STEP 1 UNTIL JI2 DO SVCIPA[DX1])};                 1347000
LIST LIST11(SVALBEDO[JI1])};                                             1348000
LIST LIST12(FOR DX1←1 STEP 1 UNTIL JI3 DO SVRFANG[DX1,JI1])};            1349000
LIST LIST13(FOR DX1←1 STEP 1 UNTIL JI3 DO SVPDR[DX1,JI1])};              1350000
LIST LIST14(FOR DX1←1 STEP 1 UNTIL JI4 DO SVRFLCOS[DX1,JI1])};           1351000
LIST LIST15(FOR DX1←1 STEP 1 UNTIL JI2 DO SVCANG[DX1])};                 1352000
LIST LIST16(FOR DX1←1 STEP 1 UNTIL JI2 DO SVPAG[DX1])};                  1353000
LIST LIST17(FOR DX1←1 STEP 1 UNTIL JI2 DO SVWAG[DX1])};                  1354000
LIST LIST18(JHS,JDLONG,JDELTA,JSMVAL,JWCO,JELIM,JDMIN)};                 1355000
LIST LIST19(JNHMAX,JNGROUP,JNRMAX,JNRMAX,JNCMAX,JNDMAX,JNPA,JNPCDL,      1356000
 JNADP,JNAG,JNRFLB,JNMAT,JNSOREG,JMAXR,JIBASE,JIBAS1,JIBAS2,JIBAS3,      1357000
 JIBAS4, JIBAS5)};                                                       1358000
LIST LIST20(JNHMAX)};                                                    1359000
LIST LIST23(I,J,SVTAUHD[I]) };                                           1360000
LIST LIST22(I)};                                                         1361000
LABEL L5,L100,L200,L300,L400,L500,L520,L600,L700,L800,L900,L908,L930,     1362000
    L5A,L5AA,L150,L170,L190,L506,L507,L508,L320,L390,L850,                1363000
 L960,L990,L1020,L1050,L1080,L2010,L2040,L2070,L2087,L3000};              1364000
SWITCH SWG01←L800,L700,L600,L500,L400,L300,L200,L100,L850,L900,L3000};    1365000
SWITCH SWG02←L5,L520,L5,L520};                                           1366000
JNMATP←0};                                                               1367000
JNBMAXP←0};                                                              1368000
JNRMAXP←0};                                                              1369000
JNRFLBP←0};                                                              1370000
JNDMAXP←0};                                                              1371000
JNPCDLP←0};                                                              1372000
JNPAP←0};                                                                1373000
JNAGP←0};                                                                1374000
L5A:READ(DAT,10,ABC[*])[L5AA]}  WRITE (CARD,10,ABC[*])}  GO TO L5A}      1375000
L5AA:REWIND(CARD)}   CLOSE(DAT,RELEASE)}                                 1376000
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```
L5: READ(CARD,FL10,LIST1)[FINIS];                                    1377000
JNDGO←0;                                                             1378000
GO TO SWGO1[JLIBRAY];                                                1379000
L100: JNMATP←JNMATP+1;                                               1380000
SVMATERL[JNMATP]←JI1;                                                1381000
          I←1;                                                       1382000
       DO BEGIN                                                      1383000
          IF SVMATERL[I]≠SVMATERL[JNMATP] THEN                       1384000
          GO TO L150;                                                1385000
          IF I≠JNMATP THEN GO TO L170;                               1386000
L150:     END UNTIL (I←(I+1))> JNMATP;                               1387000
          GO  TO  L190;                                              1388000
L170:     JNMATP← JNMATP-1;                                          1389000
L190:     READ (CARD, FL110, LIST2);                                 1390000
JLIS1←SVNDFCOS[JI1];                                                 1391000
JLIS2←SVNPHANG[JI1];                                                 1392000
IF (SVRAYLEE[JI1]≥1) THEN GO TO L5;                                  1393000
READ(CARD,FL130,LIST3);                                              1394000
READ(CARD,FL130,LIST4);                                              1395000
READ(CARD,FL130,LIST5);                                              1396000
GO TO L5;                                                            1397000
L200: JNBMAXP←JI1;                                                   1398000
JNRMAXP←JI2;                                                         1399000
READ(CARD,FL210,LIST6);                                              1400000
READ(CARD,FL230,LIST7);                                              1401000
GO TO L5;                                                            1402000
L300: JNDMAXP←JI1;                                                   1403000
READ(CARD,FL310,LIST8);                                              1404000
GO TO L5;                                                            1405000
L400: JNPCOLP←JI1;                                                   1406000
JNPAP←JI2;                                                           1407000
READ(CARD,FL410,LIST9);                                              1408000
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READ(CARD,FL130,LIST10);                                          1409000
GO TO L5;                                                         1410000
L500: JNRFLBP←JNRFLBP+1;                                          1411000
SVJREFLT[JI1]←JI2;                                                1412000
          NRFB[JNRFLBP]←JI1;                                      1413000
    I←1;                                                          1414000
        DO BEGIN                                                  1415000
    IF NRFB[I]≠NRFB[JNRFLBP] THEN                                 1416000
           GO  TO  L507;                                          1417000
           IF I≠JNRFLBP THEN GO TO L506;                          1418000
L507:      END UNTIL (I←(I+1)) > JNRFLBP;                         1419000
    GO TO L508;                                                   1420000
L506:    JNRFLBP←JNRFLBP-1;                                       1421000
    L508: READ (CARD,FL510,LIST11);                               1422000
JJAIL←SVJREFLT[JI1];                                              1423000
GO TO SWGO2[JJAIL];                                               1424000
L520: SVNRFANG[JI1]←JI3;                                          1425000
READ(CARD,FL130,LIST12);                                          1426000
READ(CARD,FL130,LIST13);                                          1427000
SVNRFCOS[JI1]←JI4;                                                1428000
READ(CARD,FL130,LIST14);                                          1429000
GO TO L5;                                                         1430000
L600: JNAOPP←JI1;                                                 1431000
JNAGP←JI2;                                                        1432000
READ(CARD,FL130,LIST15);                                          1433000
READ(CARD,FL130,LIST16);                                          1434000
IF JNAOPP≤0 THEN GO TO L5;                                        1435000
READ(CARD,FL130,LIST17);                                          1436000
GO TO L5;                                                         1437000
L700: READ(CARD,FL130,LIST18);                                    1438000
GO TO L5;                                                         1439000
L800: READ(CARD,FL810,LIST19);                                    1440000
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GO TO L5;                                                    1441000
L850: JNDH←JI1;                                              1442000
READ (CARD,FL170,LIST21);                                    1443000
GO TO L5;                                                    1444000
L900: JNPROB←JI1;                                            1445000
JIDUMP←JI2;                                                  1446000
JICHECK←JI3;                                                 1447000
JNPART←JNHMAX DIV JNGROUP;                                   1448000
IF (JNHMAX=JNPART×JNGROUP) THEN GO TO L908;                  1449000
JNHMAX←JNPART×JNGROUP;                                       1450000
WRITE(PRINT,FL905,LIST20);                                   1451000
L908: IF (JNMATP=JNMAT) THEN GO TO L930;                     1452000
WRITE(PRINT,FL920);                                          1453000
JNOGO←JNOGO+1;                                               1454000
L930: IF (JNBMAXP=JNBMAX) THEN GO TO L960;                   1455000
WRITE(PRINT,FL950);                                          1456000
JNOGO←JNOGO+1;                                               1457000
L960: IF (JNRMAXP=JNRMAX) THEN GO TO L990;                   1458000
WRITE(PRINT,FL980);                                          1459000
JNOGO←JNOGO+1;                                               1460000
L990: IF (JNDMAXP=JNDMAX) THEN GO TO L1020;                  1461000
WRITE(PRINT,FL1010);                                         1462000
JNOGO←JNOGO+1;                                               1463000
L1020: IF (JNPCOLP=JNPCOL) THEN GO TO L1050;                 1464000
WRITE(PRINT,FL1040);                                         1465000
JNOGO←JNOGO+1;                                               1466000
L1050: IF (JNPAP=JNPA) THEN GO TO L1080;                     1467000
WRITE(PRINT,FL1070);                                         1468000
JNOGO←JNOGO+1;                                               1469000
L1080: IF (JNRFLBP=JNRFLB) THEN GO TO L2010;                 1470000
WRITE(PRINT,FL2000);                                         1471000
JNOGO←JNOGO+1;                                               1472000
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L2010: IF (JNAOPP=JNAOP) THEN GO TO L2040;                                    1473000
WRITE(PRINT,FL2030);                                                          1474000
JNOGO←JNOGO+1;                                                                1475000
L2040: IF (JNAGP=JNAG) THEN GO TO L2070;                                      1476000
WRITE(PRINT,FL2060);                                                          1477000
JNOGO←JNOGO+1;                                                                1478000
L2070: IF JNOGO>0 THEN GO TO L5;                                              1479000
IF JICHECK≤0 THEN GO TO L2087;                                                1480000
SRCHECK;                                                                      1481000
L2087: I← 1;                                                                  1482000
DO BEGIN                                                                      1483000
J← 2;                                                                         1484000
DO BEGIN                                                                      1485000
IF (SVHD[I]>SVHV[J])THEN GO TO L320;                                          1486000
SVTAUHD[I]←SVTAU[J-1]+(SVTAU[J] -SVTAU[J-1])×(SVHD[I]-SVHV[J-1])/             1487000
 (SVHV[J]-SVHV[J-1]);                                                         1488000
IF (JIDUMP ≤ 0) THEN GO TO L390 ;                                             1489000
WRITE (PRINT, FL350, LIST23) ;                                                1490000
 GO TO L390;                                                                  1491000
L320: END UNTIL (J←(J+1) )>JNOH;                                              1492000
WRITE (PRINT,FL330,LIST22);                                                   1493000
L390: END UNTIL(I←(I+1))>JNOMAX;                                              1494000
       SRMAIN;                                                                1495000
SRDBEAM;                                                                      1496000
GO TO L5;                                                                     1497000
L3000: ERROR(0);                                                              1498000
 END;                                                                         1499000
COMMENT  INITIALIZING BLOCK;                                                  1500000
  XPR←0←K←0;                                                                  1501000
 SENSW[1]←FALSE;                                                              1502000
 SENSW[2]←FALSE;                                                              1503000
 SENSW[3]←FALSE;                                                              1504000
```

```
 SENSW[4]←FALSE;                                                          1505000
 SENSW[5]←FALSE;                                                          1506000
 SENSW[6]←FALSE;                                                          1507000
 SENSL[1]←FALSE;                                                          1508000
 SENSL[2]←FALSE;                                                          1509000
 SENSL[3]←FALSE;                                                          1510000
 SENSL[4]←FALSE;                                                          1511000
MAINPROC; FINISH: END;                                                    1512000
LKNJA←(TIME(2)-LKNJA)/60;DKVQK←(TIME(3)-DKVQK)/60;FZOVC←TIME(1);BLZAT;WR  1513000
ITE(PRINT[PAGE]);WRITE(PRINT,CHGUB,100*LJLDU+GCPOV,LKNJA,DKVQK);          1514000
END.                                                                      1515000
```

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13. ABSTRACT

Monte Carlo procedures designated as the LITE-I and LITE-II codes were developed to study the transport of light through the earth's atmosphere under various environmental conditions. The LITE-I code treats monochromatic light emitted from a point source, and the LITE-II code treats monochromatic plane sources of light. The codes have been written in both ALGOL for the Burroughs B-5000 and FORTRAN-II for other computers. The codes are sufficiently flexible to treat multiple scattering in an atmosphere in which air density and aerosol size distribution vary independently and arbitrarily with altitude. Provision for treating ground and cloud reflection with an albedo method is also available in the codes.

The codes have been varified through comparisons with other calculations of light transport in the atmosphere. Utilization instructions, input data formats, sample problems, and the ALGOL listings of the codes are given to aid those who wish to utilize the codes.

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14 KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Monte Carlo Methods Light transmission Radiation transport Variable density atmosphere Albedo Point Source Plane Source Multiple Scattering Mie Scattering Rayleigh Scattering						

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